INTERREG VA IMPACT EVALUATION – MID-TERM REPORT

PRIORITY 1 – RESEARCH AND INNOVATION – APPENDICES

Cogent Management Consulting LLP

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INTERREG VA IMPACT EVALUATION

PRIORITY 1 – RESEARCH AND INNOVATION

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List of Abbreviations

Abbreviation	Definition
AAL	Ambient Assisted Living
AFC	Authentic Food Company
AFRC	Advanced Forming Research Centre
AKI	Acute kidney injury
ARCH	Applied Research for Connected Health Centre
AREA	Action Renewables Energy Association
BDI	Biomedical Diagnostics Institute
BETTA	British Electricity Trading Transmission Arrangements
BREATH	Border and Regions Airways Training Hub
BSR	Business Status Review
B2B	Business to Business
C-Is	Catalyst Inc's
C-TRIC	Clinical Translational Research and Innovation Centre
CASE	Centre for Advanced Sustainable Energy
CB	Cross Border
CEO	Chief Executive Officer
CI	Co-Investigators
CIT	Cork Institute of Technology
CO	Output Indicators
Co2	Carbon dioxide
Co-Innovate	The Innovation Pathway Programme
COPD	Chronic Obstructive Pulmonary Disease
COVRES	COVID Response Study
CPM	Centre for Personalised Medicine: Clinical Decision Making and Patient Safety
CSRI	Computer Science Research Institute
CTRIC	Clinical Translational Research and Innovation Centre
DCSDC	Derry City and Strabane District Council
DCU	Dublin City University
DER	Distributed Energy Resources
DfE	Department for the Economy
DIT	Department for International Trade
DJEI	Department of Jobs, Enterprise and Innovation
DKIT	Dundalk Institute of Technology
EBR	East Border Region Ltd
ECG	Electrocardiogram
ECME	Eastern Corridor - Medical Engineering Centre
EIMR	Environmental Interactions of Marine Renewables
ER	Eligible Region
ERDF	European Regional Development Fund
ESB	Electricity Supply Board
EU	European Union
EV	Electric Vehicles
FCU	Financial Control Unit
FLC	First Level Control
FTEs	Full-Time equivalent employees
GSK	GlaxoSmithKline
HIE	Highlands and Islands Enterprise
HLS	Health and Life Sciences
HR	Human Resources
HSE	Health and Safety Executive
ICU	Intensive Care Unit
IP	Intellectual Property
IPR	Intellectual Property Rights
IRBEA	Irish BioEnergy Association
ISCE	The International Society for Computerized Electrocardiology
ISEM	Integrated Single Electricity Market

Abbreviation	Definition
ITS	Institute of Technology Sligo
LEA	Local Enterprise Agency
LEO	Local Enterprise Offices
LoO	Letter of Offer
LPE	Laser Prototypes Europe
LUH	Letterkenny University Hospital
LyIT	Letterkenny Institute of Technology
MEP	Member of European Parliament
MES	Mass Energy Storage
MNI	Manufacturing NI
NHS	National Health Service
NHSH	NHS Highlands
NI	Northern Ireland
NIBEC	Nanotechnology and Integrated Bio-Engineering Centre
NICRS	Northern Ireland Clinical Research Services
NIGEAE	Northern Ireland Guide to Expenditure Appraisal and Evaluation
NIREV	Northern Ireland Reforming the Vision
NUIG	National Universities of Ireland Galway
NWCAM	North West Centre for Advanced Manufacturing
PCI	Primary Coronary Intervention
PDRA	Post-Doctoral Research Associate
PhD	Postgraduate Doctoral Degree
PI	Principal Investigator
POC	Point of Care
POCT	Point-of-Care Testing
PPCI	Primary percutaneous coronary intervention
PPE	Personal Protective Equipment
PV	Photovoltaic
QUB	Queen's University Belfast
R&D	Research & Development
R&D&I	Research, Development & Innovation
R&I	Research & Innovation
R&I	Research and Impact
RA	Research Associates
Randox	Randox Laboratories Ltd
RCs	Research Clusters
RE	Renewable Energy
REF	Research Excellence Framework
ROI	Republic of Ireland
ROS	Reactive Oxygen Species
RTDI	Research, Technology Development and Innovation
SE	Scottish Enterprise
SECROMNI	Serological Epidemiology Study
SEM	Single Electricity Market
SEUPB	Special European Union Programmes Body
SMART	Specific, Measurable, Achievable, Realistic and Timebound
SMEs	Small and Medium-sized Enterprises
SONI	System Operator NI
SPIRE 1	Storage Platform for the Integration of Renewable Energy (2013-2015)
SPIRE 2	Storage Platform for the Integration of Renewable Energy
SSB	Scientific Supervisory Board
ST	Southern Trust
STEM	Science, Technology, Engineering and Maths
SWC	South West College
TCD	Trinity College Dublin
TRL	Technology Readiness Level
UCC	University College Cork
UCD	University College Dublin

Abbreviation	Definition
UG	University of Glasgow
UHI	University of Highlands and Islands
UK	United Kingdom
UKRI	UK Research and Innovation
UoA	Unit of Assessment
UoS	University of Strathclyde
UU	Ulster University
UWS	The University of the West of Scotland
VPH	Virtual Physiological Human
VRE	Variable Renewable Energy
VRGS	Virtual Research Graduate School
WEC	Wave Energy Converters
WHO	World Health Organisation
WHSCT	Western Health and Social Care Trust

Description of Statistics

In this report, proportions may be described as percentages, common fractions and in more general quantitative terms. Where more general terms are used, they should be interpreted as follows:

Almost/nearly all	more than 90%
Most	75%-90%
A majority	50%-74%
A significant minority	30%-49%
A minority	10%-29%
Very few/a small number	less than 10%

1. INTRODUCTION AND BACKGROUND

1.1 Introduction

The Special EU Programmes Body (SEUPB) has commissioned Cogent Management Consulting LLP (Cogent) to undertake a longitudinal Impact Evaluation of INTERREG VA Programme[1] Investment Priority Axis 1 – Research and Innovation to include three reports due by end of 2018, end of 2020 and early 2022[2].

The overall focus of the evaluation is to assess (at three stages of implementation), the impact of the interventions within the 'Research and Innovation' Priority Axis. As a full implementation evaluation is being undertaken across INTERREG VA concurrently with the Impact Evaluation, the Impact Evaluation does not seek to assess the implementation of projects nor how the Programme is operating. Rather than addressing financial and operational issues, the purpose of the impact evaluation is learning, through an exploration of the contribution of the Programme to the movement of the Result Indicator, to inform the remainder of the INTERREG VA Programme and potential future programming periods.

As agreed with SEUPB, the key focus of this second evaluation report is to provide an overview of each project's achievements at this interim stage in its rollout and to take cognisance of the actual/potential impact of the ongoing COVID-19 pandemic - to reflect any effect that it may be having on each project, any steps that projects are taking to mitigate any risk to the project's successful implementation and any support that projects may require from SEUPB to help ensure the project's successful completion.

This section of the report provides an overview of Priority Axis 1 – Research and Innovation, its aims and objectives and of the eight projects supported.

1.2 Priority Axis 1: Research and Innovation and its Objectives

1.2.1 Introduction

The Cooperation Programme states that the key aim of Priority Axis 1: Research and Innovation is to *"encourage investment in sectors that offer the most growth potential, whilst building on existing strengths, and helping the region to become more competitive in a global marketplace."*

It is anticipated that this priority axis will tackle two key weaknesses in the programme region's competitiveness, namely the:

1. The low levels of expenditure on research, development and innovation (R&D&I); and
2. An under-representation of higher value-added sectors and innovation-active small and medium-sized enterprises (SMEs)[3].

[1] For Northern Ireland, Ireland and Western Scotland
[2] The report received in 2022 will include a summary of all previous findings and will contribute directly to the programme summary of evaluation findings, to be submitted to the EU Commission.
[3] The Output Indicator Guidance document for Objective 1.2 (February 2016) defines SMEs as having: fewer than 250 full-time equivalent employees (FTEs), an annual turnover not exceeding €50m and/or an annual balance sheet total not exceeding €43m. Sole traders are excluded from this definition to maintain the purpose and ambitions of the INTERREG VA Programme to achieve significant change.

The **selected investment priorities** under Priority Axis 1: Research and Innovation and their **associated objectives** are as follows:

Table 1.1: Priority Axis 1 Investment Priorities and Specific Objectives	
Investment Priority	**Associated Specific Objectives**
1a - Enhancing research and innovation (R&I) infrastructure and capacities to develop R&I excellence, and promoting centres of competence, in particular, those of European interest.	**1.1** Increasing business and industry-relevant research and innovation capacity across the region within two target sectors; Health and Life Sciences and Renewable Energy.
1b - Promoting business investment in R&I, developing links and synergies between enterprises, R&D centres and the higher education sector, in particular promoting investment in product and service development, technology transfer, social innovation, eco-innovation, public service applications, demand stimulation, networking, clusters and open innovation through smart specialisation, and supporting technological and applied research, pilot lines, early product validation actions, advanced manufacturing capabilities and first production, in particular in key enabling technologies and diffusion of general-purpose technologies.	**1.2** Increasing the number and capacity of SMEs engaged in cross-border research and innovation activity in the region aimed at the development of new products, processes and tradable services.

1.2.2 *Objective 1.1 - Increasing business and industry-relevant research and innovation capacity across the region within two target sectors; Health and Life Sciences and Renewable Energy*

The aim of this investment priority (and its Specific Objective) is to utilise cross-border collaboration to increase the overall level of research and innovation competence and activity across the programme area in a strategic way designed to contribute towards the development of a more competitive, high value-added economy[4].

To achieve the aim of creating or enhancing research and innovation centres within the timeframe of the programme, the selection of sectors with existing capacity and capability was deemed to be essential. Therefore, it was decided that programme support would be directed towards two sectors: Life and Health Sciences; and Renewable Energy. It is anticipated that this focused approach would further develop research areas in which there are existing critical mass and those where the region has distinct advantages (thereby aligning with the EU Smart Specialisation Platform).

1.2.3 *Objective 1.2 – Increasing the number and capacity of SMEs engaged in cross-border research and innovation activity in the region aimed at the development of new products, processes and tradable services*

The aim of this investment priority (and its Specific Objective) is to build a strong export-based economy through increased awareness of, and engagement in, innovation activities by SMEs in the eligible region, specifically on a cross-border basis. In doing so the priority seeks to (inter alia):

- Increase the capacity of SMEs and micro-businesses to participate in cross-border research and innovation activities;
- Increase levels of investment in the creation of cross-border centres and projects designed specifically to strengthen the links between SMEs and Research Institutions;
- Increase the number of enterprises actively innovating to bring new products and/or new processes to the market; and
- Build systems and cultures of open innovation across the eligible region.

[4] The term R&D encompasses three types of activities: basic research, industrial research and experimental development. However, only industrial research and experimental development activities are eligible for support under the INTERREG VA programme.

To achieve these objectives, the Co-Operation Programme considered that it would be necessary to engage in an intensive programme of development with SMEs and micro-businesses within the region; which might include businesses participating in one or more of the following activities:

1. Preparatory Interventions delivered via workshops;
2. Preparatory Interventions delivered on a one to one basis;
3. Innovation Capability Development Programme;
4. Cross-border Innovation Internship Programme; and
5. Cross-border R&I Projects.

1.2.4 Summary of Specific Objectives, Result Indicators and Targets

Table 1.2 provides a summary of the Specific Objectives, Result Indicators and Targets for Priority Axis 1: Research and Innovation:

Table 1.2: Summary of Specific Objectives, Results Indicators and Targets

Specific Objective	Result Indicator	Baseline	Target
1.1 To increase business and industry-relevant research and innovation capacity across the region within two target sectors; Health and Life Sciences and Renewable Energy	The annual number of peer-reviewed journal and conference publications in two target sectors (Health and Life Sciences and Renewable Energy) with cross-border authorship and with the potential to create economic impact	4	75
1.2 To increase the number and capacity of SMEs engaged in cross-border research and innovation activity in the region aimed at the development of new products, processes and tradable services	The percentage of SMEs in the eligible region involved in research and innovation involving cross-border collaborations	22%	33%

The following is noted in relation to the two baseline figures:

1. In order to establish the baseline figure for Objective 1.1, it is understood that NISRA consulted with the three ROI Institutes of Technology that are based in the border area to establish the annual number of peer-reviewed journal and conference publications in the two target sectors (Health and Life Sciences and Renewable Energy) with cross-border authorship that they had been involved with i.e.:

   - Letterkenny Institute of Technology (LYIT);
   - Institute of Technology Sligo (IT Sligo); and
   - Dundalk Institute of Technology (DKIT).

   Therefore, for the target of 75 to be achieved one of the three aforementioned Institutes of Technology must be involved in the peer-reviewed journal and conference publications in the two target sectors. However, it is important to note that discussion with SEUPB indicates that the 'result indicator' for both Objectives 1.1 and 1.2 are not intended to relate only to activity taken forward through the INTERREG Programme (which will be measured instead through the achievement of the Output Indicators). Rather, the Result Indicators are more contextual in scope and are intended to reflect/measure overall change at the programme area level.

2. To determine this baseline for the Objective 1.2, SEUPB advised that specific questions were introduced into the January/February 2015 version of InterTradeIreland's quarterly All Ireland Business Monitor Survey. It is understood that 146 (22%, N=676) of the business respondents indicated that they undertook R&D&I and were supported by another organisation outside their own jurisdictions i.e. Northern Ireland, the border region of Ireland or Western Scotland. For the purposes of this paper (which focuses on cross-border collaborative R&D&I activity being between Northern Ireland and the border region of Ireland, excluding Scotland), SEUPB advised that 119

(22%, N=548) of the total business respondents based in either Northern Ireland (N=79) or border region of Ireland (N=40) indicated that they undertook R&D&I and were supported by another organisation outside their own jurisdictions i.e. Northern Ireland or the border region of Ireland.

The anticipated Output Indicators are summarised below:

Table 1.3: Summary of Output Indicators

Output Indicator[5]	Objective		Total
	1.1	1.2	
No. of enterprises receiving support	20	1,408	**1,428**
No. of enterprises receiving grants	10	19	**29**
No. of enterprises receiving non-financial support	20	1,408	**1,428**
FTE Years of PhD (or above) level research	514	0	**514**
No. of enterprises cooperating with research institutions	10	50	**60**
No. of enterprises participating in cross-border, transnational or interregional research projects	10	19	**29**
No. of research institutions participating in cross-border, transnational or interregional research projects	5	5	**10**
No. of enterprises receiving one to one innovation advice	-	469	**469**
No. of enterprises in receipt of an innovation capability development programme	-	94	**94**
No. of enterprises engaging an innovation intern, on a cross-border basis.	-	70	**70**

NB following the completion of the first in a series of three reports that will provide a longitudinal Impact Evaluation of Priority Axis 1 – Research and Innovation, the Evaluation Team considered that it was evident that some projects were meeting some of the Common Indicator targets with relative ease. Consequently, during early 2020, SEUPB asked Cogent to:

- Review the Cooperation Programme targets and the EU common indicators;
- Review the targets in each of the LoOs, and a comparison of known activity (up to that included in the recent evaluation report), alongside a view on the reasonableness of the targets established (both in terms of scale and appropriateness given the nature of the activity);
- Provide recommendations on the best way forward in terms of any disconnect between the Cooperation Programme and LoO targets;
- Provide recommendations for future target setting on similar R&D focused programmes.

The subsequent report[6] contained the following recommendations amongst others:

1. At the time of writing (February 2020), all of the Priority Axis 1 projects have been operational for a period of circa 3 years, and each has signed Letters of Offer with SEUPB with their project targets featured. Evidently, the output targets set out in the Cooperation Programme are much less than the cumulative values featured in the individual supported projects' Letter of Offer. The Review Team recommends that the targets featured in the Cooperation Programme are replaced, in the first instance, with the cumulative targets featured in the eight Letters of Offer.

2. Where there is flexibility (albeit there may be little as the Letters of Offer are legally binding), SEUPB should consider revising the result indicators for both Investment Priorities.

SEUPB has advised (in December 2020) that based upon these recommendations, the Managing Authority proposes to modify the programme, so that the targets in the Cooperation Programme are the same as those in the projects' Letter of Offer.

[5] Each output indicator is defined in the 'Output Indicator Guidance' documents for Objectives 1.1 and 1.2.
[6] INTERREG VA Programme Investment Priority 1: Research and Innovation – Review of Output and Result Indicators (Cogent Management Consulting, March 2020)

The INTERREG VA Citizens' Summary suggested that the above outputs might be achieved through the following **indicative actions**:

Table 1.4: Indicative Actions[7]
Objective 1.1
• The creation of clusters which will enable the development of virtual centres of excellence within the region, involving capacity and competence building; • Clusters will complement existing R&I strategies within jurisdictions by promoting cross-border cooperation and will take the form of partnership arrangements between existing institutions in academia, public sector agencies and private sector companies; • The further development of existing competence centres to facilitate increased levels of cross-border collaboration; and • The clusters will address market failure in the Research, Technology Development and Innovation (RTDI) landscape, whereby the risk associated with the longer-term nature of strategic research carried out cannot be addressed by individual companies.
Objective 1.2
• Education and awareness-building programmes aimed at SMEs. • One-to-one mentoring and advice programmes for SMEs. • Innovation capability audits within SMEs. • Development and implementation of innovation action plans tailored to the needs of the SMEs which address innovation capability deficiencies. • Innovation internship programmes incorporating technology job creation, designed to address the capability deficiencies. • A collaborative R&D programme designed to create and support collaborative research projects between SMEs and research institutions.

[7] Source: Citizens' Summary: INTERREG VA Programme (2014-2020).

1.3 Overview of Projects Supported

Table 1.5 provides an overview of the 8 projects approved by the IVA Programme Steering Committee[8].

Table 1.5: Summary of Projects Approved for Funding[9][10]

Project Ref	Lead Partner	Project Name	Operational start date	Operational end date	Anticipated Project Cost (€)
Objective 1.1					
045	Dundalk Institute of Technology (DKIT)	BREATH (Border and Regions Airways Training Hub)	01/01/2017	30/06/2022[11]	€8,506,929
046	South West College (SWC)	Renewable Engine	01/01/2017	31/07/2021	€6,104,995
047	Catalyst Inc.	North West Centre for Advanced Manufacturing	01/04/2017	31/12/2021	€8,779,853
048	Ulster University (UU)	Eastern Corridor - Medical Engineering Centre (ECME)	01/03/2017	31/12/2021	€8,362,917
049	Ulster University (UU)	Storage Platform for the Integration of Renewable Energy (SPIRE 2)	01/03/2017	31/12/2021	€6,703,246
052	Ulster University (UU)	Centre for Personalised Medicine: Clinical Decision Making and Patient Safety (CPM)	01/04/2017	31/12/2021	€9,424,927
053	Queen's University Belfast (QUB)	The Bryden Centre for Advanced Marine and Bio-Energy Research	01/06/2017	31/12/2021	€9,752,680
Subtotal					**€57,635,547**
Objective 1.2					
003	InterTradeIreland	Co-Innovate (The Innovation Pathway Programme)	01/08/2016	31/09/2022[12]	€22,443,035
Total					**€80,078,582**

[8] The decision as to whether to fund a project rested entirely with the IVA Programme Steering Committee.
[9] Projects were approved at IVA Programme Steering Committees held on: 6/9/2016, 7/9/16, 23/11/2016 and 14/3/2017.
[10] Source (unless otherwise stated): Letters of Offer issued by the SEUPB.
[11] NB: Original LoO was 31/12/2021. It was noted during consultation that the project end date had been extended.
[12] NB: Original LoO was 31/03/2022. It was advised during consultation that the project end date had been extended by 6-months (approved in March 2020).

The contribution that each of the 8 projects is anticipated to make to the Priority's key Output Indicators is detailed below:

Table 1.6: Projects Approved for Funding – Stated Contributions to Output Indicators (source: Letters of Offer issued by the SEUPB)									
Output Indicator	**Project Ref**								**Total**
	1.1							**1.2**	
	BREATH	**Renewable Engine**	**NWCAM**	**ECME**	**SPIRE2**	**CPM**	**Bryden Centre**	**Co-Innovate**	
No. of enterprises receiving support	5	8	8	10	12	5	30	1,408	**1,486**
No. of enterprises receiving grants	2	4	2	5	2	3	8	30	**56**
No. of enterprises receiving non-financial support	5	8	8	10	12	5	30	1,408	**1,486**
Years of PhD (or above) level research	89.5	57.05	98.5	95	83	80.5	132.5	n/a	**636**
No. of enterprises cooperating with research institutions	5	8	8	10	12	5	30	50	**128**
No. of enterprises participating in cross-border, transnational or inter-regional research projects	2	8	8	10	12	5	30	30	**105**
No. of research institutions participating in cross-border, transnational or inter-regional research projects	3	4	4	5	4	4	5	5	**34**
No. of enterprises receiving one to one innovation advice								469	**469**
No. of enterprises in receipt of an innovation capability development programme								94	**94**
No. of enterprises engaging an innovation intern, on a cross-border basis								70	**70**

2. IMPACT OF COVID-19

2.1 Introduction

Given the unprecedented onset of the COVID-19 pandemic and its potential to impact on both the implementation of the eight Priority Axis 1: Research and Innovation projects and ultimately their ability to achieve their aspirations, SEUPB asked the Evaluation Team to ascertain the impact that COVID-19 was having on the projects. Consequently, the Evaluation Team completed consultations each of the project leads to understand the implications of COVID-19 on their organisation and project, which sought to help SEUPB:

- Identify any issues that the projects are facing and/or the risks to the projects' successful implementation;
- Ensure that projects have considered the implications of the pandemic and that appropriate plans have been put in place in response; and
- Identify any further support that the projects might require to ensure their successful implementation.

2.2 Summary of Key Findings

The table below provides a high-level summary of the key findings derived from those consultations:

Table 2.1: R&I Covid-19 Implications Survey Key Findings

Project	Potential risk that the project will not achieve its aims and objectives	Suggested need for a time extension	Potential for budget underspend at the end of the project period	Adaptions to project activities, target groups and outputs
BREATH	No-Risk	No	No	No
Renewable Engine	No-Risk	No	No	No
NWCAM	High Risk	Yes	No	Yes (Some projects may not be able to carry out testing. Training has been reorganised to online entrepreneurship training.)
ECME	Some Risk	No	No	Yes (Changed the focus of mini-projects from cardiac to Covid-19 specific projects in the WHO priority areas)
SPIRE2	Some Risk	No	Yes (11% underspend)	No (However indicated that whilst their outputs will not change, enterprises involved may change as the pandemic progresses and furlough and other govt support ends.)
CPM	Some Risk	No	No	No
Bryden Centre	Some Risk	Yes (6 Months)	No	No
Co-Innovate	Some Risk	Yes	No	Yes (Taken workshops online as well as Business Status Reviews and innovation audits via online and telephone)

Key points to note concerning Table 2.1 include:

- 6 of the 8 projects consider that the onset of the COVID-19 pandemic and the associated lockdown and disruption to normal working practices have created a risk that their project will not fully achieve its aims and objectives. One project (NWCAM) considered that there was a 'high risk' that this was the case;
- 3 of the 8 projects have made some adaptations to their project as a result of the COVID-19 pandemic;
- 3 of the 8 projects consider that their project will likely require an extension to its originally anticipated timescales to complete successfully;
- 1 of the 8 projects considers that they will likely not be able to spend their full budget allocation.

The following sub-sections provided a detailed analysis from the COVID-19 focused consultations with the eight project leads.

2.3 Implications of the COVID-19 Pandemic for project implementation

2.3.1 Likelihood of achieving aims and objective as outlined in the LoO

Each of the eight project leads considered that, before the onset of the COVID-19 pandemic, their project was on track with no substantial risk to it fully achieving its aims and objectives as outlined within their LoO, with:

- 3[13] (of 8) projects stating that their project was, before COVID-19, fully on track with little risk to it fully achieving its aims and objectives; and
- 5[14] (of 8) projects suggesting that their project was, prior to COVID-19, mostly on track with no substantial risk to it fully achieving its aims and objectives.

Whilst some projects noted that pre-COVID-19 they had experienced some issues such as changes to the composition of the project partnership[15], equipment breaking down and in the case of one project, a PhD student having to take a leave of absence, it was considered that these issues were not sufficiently significant to prevent their project achieving its aims and objectives.

Table 2.2: Extent project was on track to achieve its aims and objectives (N=8)

	Pre-COVID	Current Position
The project was (is) fully on track with little risk to it fully achieving its aims and objectives	3	-
The project was (is) mostly on track with no substantial risk to it fully achieving its aims and objectives	5	2
The project had been changed from that presented in the original project application but was (is) on track to fully achieve its new aims and objectives	-	-
The project was (is) behind schedule and there was (is) a risk that it would (will) not achieve its aims and objectives	-	5
The project was (is) behind schedule and there was (is) a high risk that it would (will) not achieve its aims and objectives	-	1
The project had been changed from that presented in the original project application, and there was (is) a risk that it would (will) not achieve its aims and objectives	-	-
The project had been changed from that presented in the original project application, and there was (is) a high risk that it would (will) not achieve its aims and objectives	-	-

[13] Renewable Engine, SPIRE 2, and BREATH
[14] CPM, ECME, NWCAM, Bryden Centre and Co-Innovate.
[15] NWCAM indicating that the composition of its industrial partners had changed.

However, per Table 2.2, the situation has changed considerably as a result of the COVID-19 pandemic and associated lockdown measures with only two projects[16] continuing to feel that their project was mostly on track with no substantial risk to the project fully achieving its aim and objectives. The remaining six project leads now consider that their project is potentially at risk of not achieving its aims and objectives, with:

- 5[17] (of 8) respondents indicating that their project is behind schedule and there is now a risk that it will not achieve its aims and objectives; and
- 1[18] (of 8) respondent felt that their project is behind schedule and there is a high risk that it will not achieve its aims and objectives.

The project leads highlighted several impacts that COVID-19 has had (or that they anticipate it will have) on their ability to achieve the project's aims and objectives including:

- The need to work remotely with no access or limited access to laboratories or sites which will delay the progression of necessary laboratory/site work; and
- The suspension of patient recruitment and data collection which will delay other project work.

CPM	*"We anticipate that most of our project aims will be achieved. However, as a result of the COVID-19 pandemic, the project had to suspend all patient recruitment in March 2020. CPM hopes to resume patient recruitment in the coming months (at the time of consultation - August) and direct it towards COVID-19, albeit this is dependent on SEUPB's approval* (NB CPM highlighted that the modification was submitted to SEUPB in June and they were hoping for a response at the end of August). *Also, from March 2020 onwards, all patient data collection for non-COVID research was stopped for the foreseeable future.* *COVID-19 has also impacted 4 research clusters and 2 work packages: point of care testing and clinical care pathway. The final deliverable on both work packages is to put in place/run a pilot, however, this now all depends on the success of the research (the wording of this deliverable may need to change).* *All laboratory work was put on hold as all partners have been working remotely. One Doctor (another partner) doing a PhD was redirected to clinical work and his time stopped on the CPM project. There has also been an increased workload for researchers as the pandemic is relevant to the CPM project."*
NWCAM	*"Our research facilities closed, which has had knock-on effects on the level of work completed. Despite this, academics have managed quite well through the lockdown."*
Bryden Centre	*"There is an increased level of risk. In terms of PhD progress, 6 out of the 34 PhDs are on an amber traffic light system meaning there are concerns on their progress and 1 is on red. 1 PhD student is looking likely to have to withdraw due to COVID-19."*
SPIRE 2	*"Some researchers were able to work on and their work has not been affected by the pandemic as they proceeded as normal. However, laboratory access was only granted recently (July/August) which meant that there have been major delays on this aspect of the project. Site activities have been delayed, for example, the Housing Executive had issues with installing equipment on sites due to the lockdown."*
ECME	*"SEUPB allowed us to change the focus of our mini-projects from cardiac to covid-19 related, which we believe will be potentially more impactful. However, there is a risk that we will not achieve our joint publication target. This was always going to be challenging given the multidisciplinary partners involved but there is now limited opportunity to collaborate in a meaningful way as a result of the covid-19 pandemic, and only being able to communicate remotely."*
Co-Innovate	*"The pandemic has exacerbated the situation. Strand 4 has taken a big hit, trying to work cross-border. At this point, it has been knocked back by 3 months due to not being able to travel and access to laboratories denied as they had to close, meaning projects either could not start or were put on hold in April."*

[16] Renewable Engine, and BREATH
[17] CPM, Bryden Centre, SPIRE 2, ECME and Co-Innovate.
[18] NWCAM

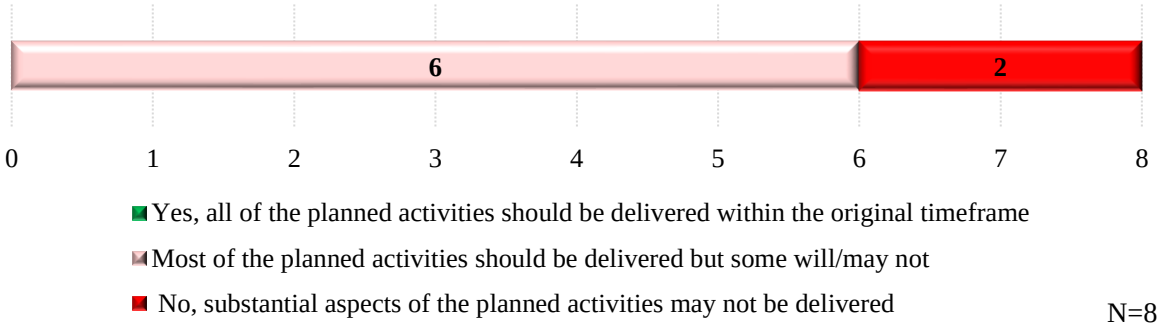
One[19] of the lead partners noted that there had been very little risk to the project as a result of the COVID-19 pandemic, noting that students took the opportunity to analysis and write up what they had completed so far.

2.3.2 *Feasibility of Delivering the project's planned activities within the original timeframe*

All eight project leads were of the view that it may no longer be feasible to deliver all of their project's planned activities within the original timeframe.

Specifically, 6[20] (of 8) project leads indicated that most of the planned activities should still be delivered but some may or will not, whilst the remaining two[21] noted that substantial aspects of the planned activities may not be delivered within the original timeframe.

Figure 2.1: Is it still feasible to deliver all of the project's planned activities within the remaining timeline?



The project leads highlighted that the following activities have been (or will be) affected by the COVID-19 pandemic and may no longer be possible to complete:

- Events and conferences;
- Laboratory and site access;
- PhDs' secondments in partner institutions;
- Challenges around joint publications;
- Some PhDs may not finish; and
- Finding new companies to participate.

Specific comments from project leads are detailed below.

Most of the planned activities should be delivered, but some will/may not	**Renewable Engine**	*"The project might be rushed towards the end. There is potential that some dissemination activities could be delayed into 2021 if conferences and other events are postponed. We are waiting for events to be safe and to see if they can be run in the end.* *Also, work in chemistry labs has become difficult to deliver; however, we are exploring modelling and simulations which have their own merits but real experimental data will be needed to attain the level required for PhD research."*
	SPIRE 2	*"We are currently facing delays due to limited or no site access, but this should not affect our ability to achieve our outputs as long as we can receive an extension. Students may extend over the project end date. The test houses and laboratories should have access soon and be able to install the equipment. There is quite a bit of uncertainty around project timing. If another lockdown were to come into force it could hold us up further. We need access to houses in Fermanagh and if local lockdowns are put in place it could also push us back."*

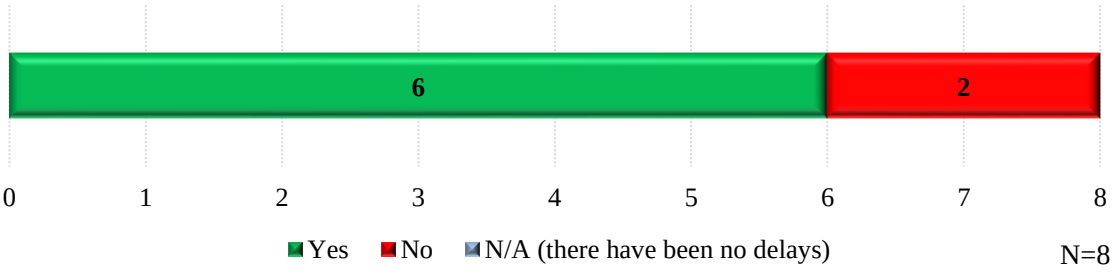
[19] BREATH
[20] Bryden Centre, SPIRE 2, CPM, ECME, Renewable Engine and BREATH
[21] NWCAM and Co-Innovate.

	Bryden Centre	*"Some aspects will not be achieved without an extension. We will likely receive a 6-month extension which was needed before COVID-19, but we understand that this may not be granted until the final year of the project as SEUPB are too busy at the minute."*
	CPM	*"The patient recruitment has been delayed. Conferences and events have been rearranged virtually or cancelled. We may need to extend the project's timeframes due to delays in staff starting. We also require additional personnel (a request has already been submitted to SEUPB)."*
	ECME	*"There are challenges around joint publications and finishing some projects in the timeframe due to the lack of laboratory access. Some delays may mean the project is less impactful as PhD students may not finish their PhDs, but this is not a project output and therefore would not affect the achievement of the project outputs. Industry is fine and there are no issues. The project adapted well to working remotely through zoom etc."*
	BREATH	*"At present, there is very little risk to the project. We lost 5 months' lab time during restrictions, but we mitigated this by PhD students using the time to partially write their theses. Also, all of the normally scheduled meetings, the annual BREATH conference and training events proceeded on schedule, albeit by virtual means.* *At present, all of the PhD students are back in the laboratories on a restricted schedule to maintain social distancing. However, they are working longer hours on their days in and are sometimes working at the weekends, hence productivity has been high. We would have no specific worries, unless there are further restrictions imposed or there is an outbreak of COVID-19 among staff or students. Several periods of imposed quarantine could significantly impact on the project outputs. Some of these projects may need a short no-cost extension (no cost based on virement of unspent funds such as conferences and travel that have been limited by the crisis.) The project overall has been given a no-cost extension until June 2022, but this was to facilitate completion of our industrial collaborations. However, this will now be useful also in the context of time lost due to COVID-19. If a no-cost extension is granted, it could allow students to stay in laboratories for four months, whereas normally they would be writing up their work in the final 4 months.* *We were already ahead of schedule in most of our outputs, including conference publications and training years. However, it is possible that publication of full papers may be slightly delayed (by up to 6 months) due to time lost in data collection. The PhD students were scheduled to undergo secondments in partner institutions, but several of these had to be postponed due to restrictions. It is uncertain how these might proceed in the future in the present context. A student in Scotland started a year after everyone else; she will likely require a no-cost extension. Laboratory work was put on hold as well as clinical sample collection. The finalisation of some papers for submission depended on the return to the laboratory to complete final experiments. As BREATH works on a paper system for receipts, the lockdown made these very difficult to access, which could lead to delays later for auditing purposes, although we were again granted access as soon as restrictions were lifted."*
Substantial aspects of the planned activities may not be delivered.	**NWCAM**	*"Substantial aspects will not be able to be achieved. We are assessing where we are with projects. Some students had sampling and testing already completed and were able to work on those at home, however many did not. We are still understanding where we are at but there are potentially substantial aspects of planned activities that we may not be able to deliver."*
	Co-Innovate	*"Strand 4 is a major risk. It is the unknown whether companies will come back online or not, it is too difficult to establish the impact at this point. We have already lost 5 participants to COVID-19 and do not know when, or if companies will come back online, and if not, we will have to find new companies. Also, to address the disparity between Strand 1 places left to recruit, there may be an option for companies to go directly to BSR without going through Strand 1."*

Encouragingly, the majority (6[22] of 8) of the project leads noted that it would be feasible to make up for any delays (i.e. as of August/September 2020) caused by COVID-19. However, 2[23] project leads considered that it may not be possible to make up for the delays experienced, citing the following reasons:

- The time it takes for new projects to be set up; and
- The reduction in research time/years as a result of staff being furloughed.

Figure 2.2: It is feasible to make up for delays caused by COVID-19?



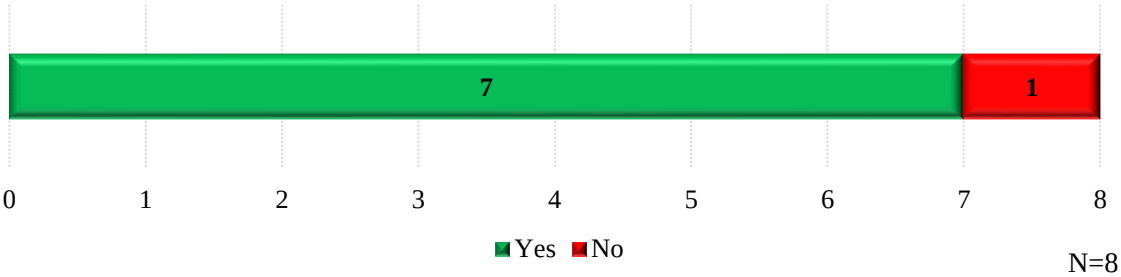
Co-Innovate	*"If the projects that are on hold come back online then there should be no problem but if projects do not come back online it would take 6 months to get the new projects agreed and set up etc."*
NWCAM	*"In some cases, it is impossible to make up for delays. For example, Glasgow University furloughed staff which has an impact on research years for that period. If they were on furlough for 2 quarters, 2 quarters times x number of staff, cannot be contributed to the project because they cannot make up the lost time. If there was additional money available, we could hire an additional body for 6 months to make up the research years. However, researchers recognise the delay and have a real passion to make up for the lost time and to address the delays."*

The respondents who felt it was feasible to make up for the delays experienced as a result of COVID-19 noted that this would depend on how long the lockdown continues for, as although the projects adapted well to remote working, some work cannot be completed remotely.

2.3.3 Ability to Deliver Project within Original Budget

Almost all (7 of 8) of the project leads stated that they will be able to deliver their project fully within its current budget. Whilst one[24] project lead indicated that it is unlikely that they will be able to deliver their project fully within its current budget (i.e. COVID-19 has led to an increase in costs).

Figure 2.3: Deliver project fully within its current budget



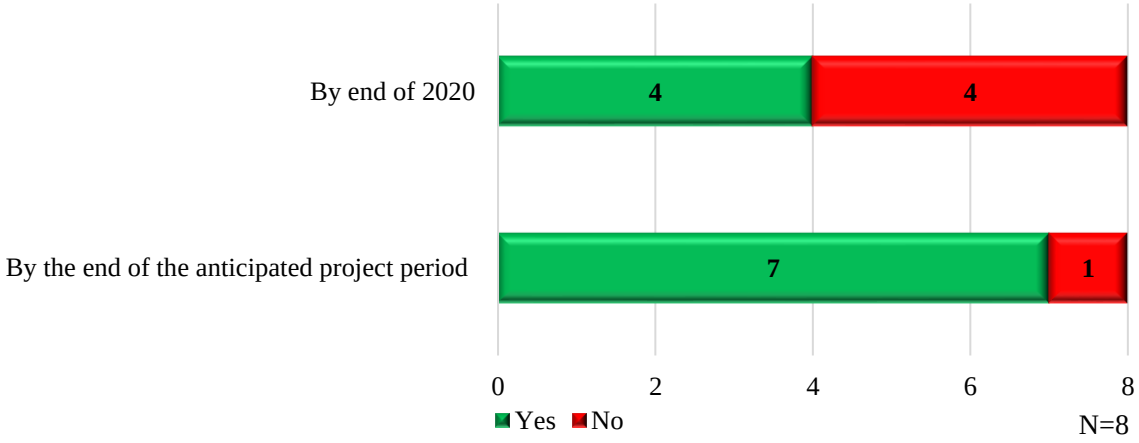
[22] Renewable Engine, CPM, ECME, SPIRE 2, Bryden Centre and BREATH.
[23] NWCAM and Co-Innovate.
[24] NWCAM

"We are in a position where people are working from home and are not able to do the research, contracts have already been paid for, but no testing has been done, and this will need to be completed in the future, but we are unsure if the contracts will need to be paid again. Also, some staff were furloughed in our partner organisations and it would not be possible to make up for their lost time without additional budget." (NWCAM)

The SPIRE 2 project lead noted that whilst the project will be delivered within its current budget, the budget will need to be reprofiled as there will be underspend in the travel budget. Also, two[25] project leads stated that any extension to the project would not require additional budget.

Four[26] (of 8) of the project leads felt that they will not be able to reach their anticipated level of expenditure by the end of 2020. Whilst 7[27] (of 8) project leads were positive that they will spend the full budget allocation by the end of the anticipated project period.

Figure 2.4: Reach the anticipated levels of expenditure



Concerning the proportion of the budget that may be underspent during 2020, the four respondents each suggested between 10%-20%, due to a reduction in travel expenses, cancellation or postponement of conferences and events, and delays in purchasing equipment.

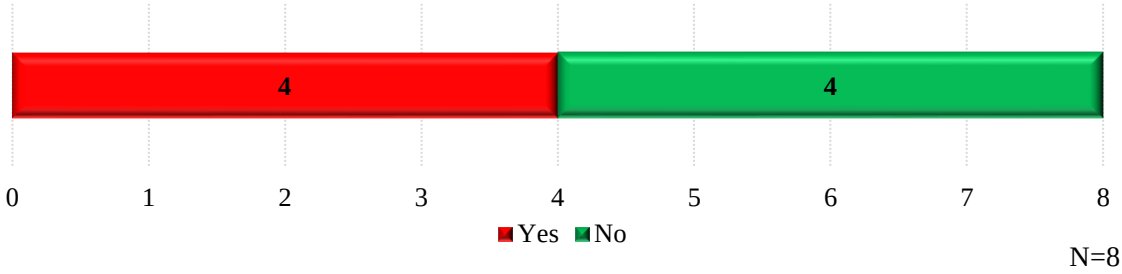
Co-Innovate	*"20% of the budget may be underspent in 2020, however, we are currently in the process of re-forecasting the budget."*
Renewable Engine	*"10% of the budget may be underspent by the end of 2020. This is because we would have put in for travel expenses etc. which were not needed as we were not allowed to travel due to the lockdown. Other reasons for the underspend include conferences and events being postponed or not going ahead and experimental research work."*
SPIRE 2	*"10% by the end of 2020 and 11% by the end of the project period. There is no need for travel at the minute, we have not purchased the equipment we had anticipated for the year and there are vacant posts. We do not see much change happening with travel by next year either."*
NWCAM	*"We can't be completely sure at this stage, because there is a delay in procurement and equipment purchasing. There are many stages, and it is hard to know if they will be able to work quickly enough. The finance team only had limited access whilst working at home for security reasons."*

[25] CPM and ECME.
[26] Renewable Engine, SPIRE 2, NWCAM, and Co-Innovate
[27] Renewable Engine, CPM, ECME, NWCAM, Bryden Centre, Co-Innovate and BREATH

2.3.4 *Risks to the Achievement of Project Results*

4[28](of 8) project leads were of the view that COVID-19 and/or the lockdown measures or matters related to it will jeopardise the expected results of their project.

Figure 2.5: Risks to the achievement of the Project's results



The four project leads foresee the following impacts that may jeopardise the project's anticipated results:

- A shortfall in the number of projects;
- Reduction in the number of joint publications produced;
- No access to laboratories;
- Decrease in the impact/quality of the final product;
- Lack of face to face collaboration and networking at conferences/meetings etc.; and
- Reduction in research years.

Co-Innovate	*"Strands 1-3 and 5 will all achieve their targets and spend. However, Strand 4 has many risks. There is a risk of a shortfall of between 15-20 in the number of projects."*
ECME	*"It may jeopardise the joint publications as we cannot get together in the same way as before COVID-19 and attend conferences. Researchers do not have access to laboratories and patients which may make the outcomes of the project less impactful. The training is also done digitally which may too be less impactful."*
NWCAM	*"Researchers are developing a new product or improving a process but due to COVID-19, they have reduced time to do so from less laboratory time, etc. The quality of the final product may not be as refined as it would have been, as the researchers do not have the time to go back and make it better. Therefore, the expected results will not be as good.* *Also, the work completed by GSK Stiefel was affected by the closure of the plant, therefore the area which they were working on cannot be applied to other areas, as would have been the case if they had the time.* *The innovation broker's role is to commercialise the research and support the industry partners to identify the market for a product, but they will not be able to fully commercialise the product for the partners due to having less time. This means there is less promotion because the product is anticipated to be made earlier.* *The lost time has also impacted the early career researchers. It is a long time to be isolated and not with their peers. The cross-border journals will be impacted because we had planned to host networking opportunities to get the ideas for these journals and that only happens with conversations. We had talked about having them online but wanted to get them talking physically to build relationships. We trialled it within Catalyst but decided not to go forward with it, but if things do not improve it will have to go online."*
Bryden Centre	*"There is a great risk to the project as the COVID-19 pandemic is still ongoing and is far from over. We have more risks on our risk register and the potential of a second wave is worrying. As a result of the pandemic, there is a high risk that not all the PhDs will finish in time; therefore, we will not hit the target of 34 PhDs, which will have knock-on effects on the development and publication of papers. Mitigation was put in place as we were expected to deliver more papers than targeted. However, the number of research years will decrease, and we cannot recruit another student at this stage."*

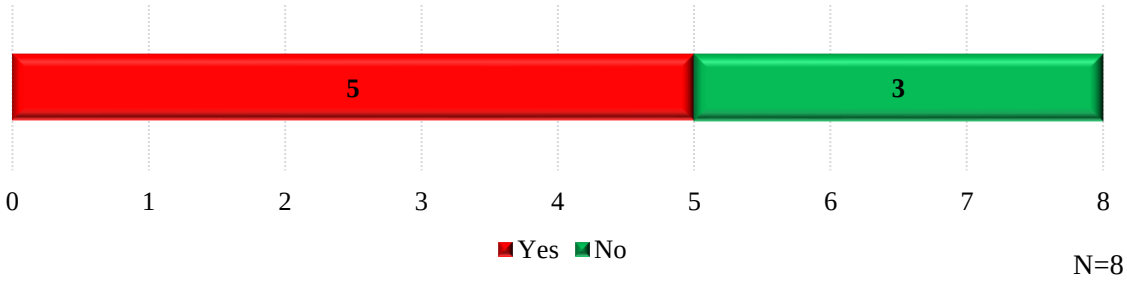
[28] ECME, NWCAM, Bryden Centre and Co-Innovate.

2.3.5 *Other Potential Risks*

Most (5[29] of 8) project leads considered that there were further risks posed to their projects due to the COVID-19 pandemic. These included:

- Limited engagement or involvement with industry;
- Mental health concerns relating to project personnel due to isolation; and
- Lack of opportunities to transfer knowledge to industry.

Figure 2.6: Further Potential Risks



Renewable Engine	*"To our industry partners, there is a further risk. The economic downturn means that manufacturers are at risk and the companies could go under, therefore, the project could lose the connection of R&I into the industry. To mitigate this risk, we have been communicating very regularly with our industry partners. We have also increased the claims period to monthly, instead of quarterly, to help with cash flow.* *We are particularly concerned about the potential impacts on the mental and physical wellbeing of researchers, especially those who have moved to the UK and Ireland to participate in the programme, who may feel isolated. However, we are endeavouring to increase contract through remote means."*
CPM	*"Although this is not COVID-19 related, enterprises that are involved in contributing cash and in-kind to the project have had, issues verifying their contribution. The SEUPB verification process is troublesome as these businesses do not want to provide the significant level of detail that is requested.* *Also, there was an unexpected ban on staff recruitment in one partner which meant we had to request the transfer of money to another partner so they could recruit the required staff. Staff turnover has been high for several research clusters, so we are working closely with the organisations' HR departments to ensure posts are prioritised.* *Furthermore, whilst the research may be cross border, not all papers will reflect this in the authorship, due to the strict guidelines at each academic site about who can be included in academic papers."*
SPIRE 2	*"Enterprises' focus has changed to profits and survival, and the activities on our project have taken a back seat. The next number of months will tell a big story as furlough comes to an end. There are a couple of companies we would be wary of closing. The enterprises are in a completely different place than they were at the beginning of the year. We are in contact with a few other companies and working with them, but the companies that started on the project may not finish it. Some companies left the project before COVID-19.* *There is also a risk surrounding the PhDs, as a lot of them are from overseas. Their wellbeing and mental health could be at risk. It is nice to see them but when they are off-campus it is difficult to keep track of them, they are in contact online with each other. They are more isolated than our local students and we have been offering them online support. More generalised risks would be that we do not know where we are going next and when students might get back to campus etc."*

[29] Renewable Engine, CPM, SPIRE 2, NWCAM and Bryden Centre.

NWCAM	*"There is the risk of losing our industry partners because of the economic downturn. Businesses are now focusing on their survival. We are worried that they will not survive. The researchers could continue but the whole point was to produce goods and services with the collaboration of industry and researchers. We are also worried that the industry partners will lose interest in R&D, as R&D is seen as "nice to do" but not essential and instead focus on the core business as they do not have time. However, we have acknowledged this risk and are engaging closely with the industry partners, staying on their radar, and managing relationships by being supportive.* *Also, we are signposting our industry partners to the support available. Different Catalyst support has been offered. As laboratories and offices closed, we offered space for them if they could not concentrate at home. Also, we nominated partners for awards to raise profiles and boost their morale (Innovation Awards)."*
Bryden Centre	*"Our Industry Partners are now more conservative about taking things forward. The transfer of knowledge from PhD to industry had to be put on hold due to the lockdown and some students may not be able to go back and complete this work. Maximising our impact with industry partners will be harder because visiting sites is more difficult, but we will do what we can. We were about to go around our industry partners and find out how work has impacted them, but this could not be completed due to the lockdown. We may do this next year, but the impact could have lessened."*

2.4 Measures Taken as a Result of COVID-19

Each of the project leads provided information, to the best of their knowledge, on the specific measures that their organisation, their project partners and direct beneficiaries of the project implemented as a consequence of the COVID-19 pandemic. The most common measures implemented were that their organisation, project partners or direct beneficiaries had:

- Staff working remotely instead of at their normal place of work; and
- Furloughed Staff.

Of note, all project leads stated that each of the universities involved in projects had closed their campuses and laboratories during the lockdown period. As laboratories and campuses reopen, one project lead (BREATH) highlighted that its students had been split into two groups, one group working Monday to Wednesday and the other working Thursday to Saturday, to ensure government guidelines on social distancing are adhered to within the university laboratories.

Table 2.3: Measures implemented as a consequence of COVID-19 (N=8)

	Their Organisation	Project Partners	Direct beneficiaries of the project
Furloughed Staff	-	5[30]	6[31]
Temporarily stopped operating	-	-	5[32]
Had staff working remotely instead of at their normal place of work	8	8	6[33]
Decreased normal hours of operation	1[34]	-	2
Made staff permanently redundant	-	1[35]	2[36]
Changes to Normal Working Practices	-	2[37]	1[38]

[30] CPM, SPIRE 2, NWCAM, Bryden Centre and Co-Innovate.
[31] Renewable Engine, ECME, SPIRE 2, NWCAM, Bryden Centre and Co-Innovate.
[32] Renewable Engine, SPIRE 2, NWCAM, Bryden Centre and Co-Innovate.
[33] Renewable Engine, CPM, SPIRE 2, NWCAM, Bryden Centre and Co-Innovate.
[34] NWCAM.
[35] Bryden Centre.
[36] Renewable Engine and Co-Innovate.
[37] ECME and Co-Innovate.
[38] ECME.

ECME	*"Some of the project partners and direct beneficiaries of the project have focused on COVID-19 in hospitals or changed their activities to COVID related projects (e.g. manufacturing PPE etc.)."*
Co-Innovate	*"A project partner was only allowed to grant award funding to COVID-19 support programmes for 3 months rather than Co-Innovate. COVID has made cross-border collaboration very difficult, particularly when it comes to employing new interns. Employing new interns because staff are on furlough or have been made redundant is undesirable."*

2.5 Support Requested From SEUPB

6[39] (of 8) project leads indicated that they had requested specific support from SEUPB relating to their project during the COVID-19 pandemic. These requests included:

- An extension to their project timeframe (N=3);
- Permission to vary project activities and associated cost categories (N=4);
- An increase in their funding allocation to cover unforeseen costs associated with the pandemic (N=1); and
- Changes to the structure/membership of the project partnership (N=1); and

Figure 2.7: Requested support from SEUPB

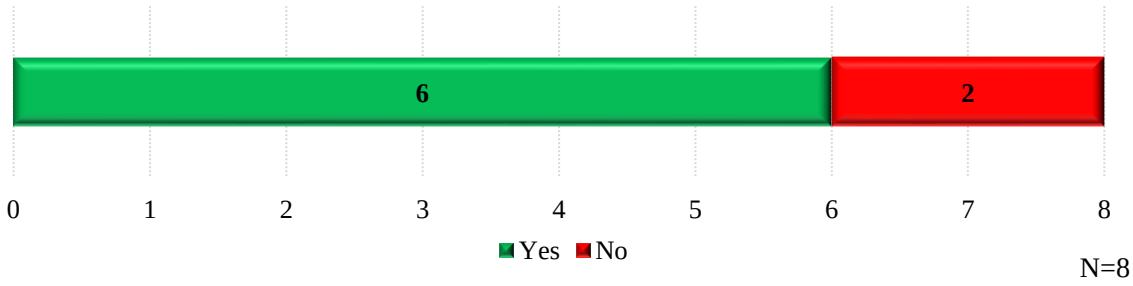


Table 2.4: Support from SEUPB		
	Requested Support(N=6)	**Other support Required (N=6)**
An extension to their project timeframe	3[40]	4[41]
An increase in their funding allocation to cover unforeseen costs associated with the pandemic	1[42]	1[43]
Permission to vary project activities & associated cost categories	4[44]	1 [45]
Permission to vary project targets	-	1[46]
Changes to the structure/membership of the project partnership	1[47]	-

[39] CPM, ECME, SPIRE 2, NWCAM, Bryden Centre and Co-Innovate.
[40] Co-Innovate, NWCAM and Bryden Centre.
[41] Bryden Centre, Renewable Engine, SPIRE 2 and NWCAM.
[42] NWCAM.
[43] Bryden Centre
[44] CPM, Co-Innovate, SPIRE 2 and ECME.
[45] BREATH
[46] Co-Innovate.
[47] NWCAM.

In addition to the support that had already been requested, 6 project leads stated that other forms of support from SEUPB would be beneficial to enable them to deliver their project as fully as possible, these include:

- An extension to their project timeframe (N=4);
- Permission to vary project activities (N=1);
- Permission to vary project targets (N=1); and
- Permission to vary project activities and associated cost categories (N=1).

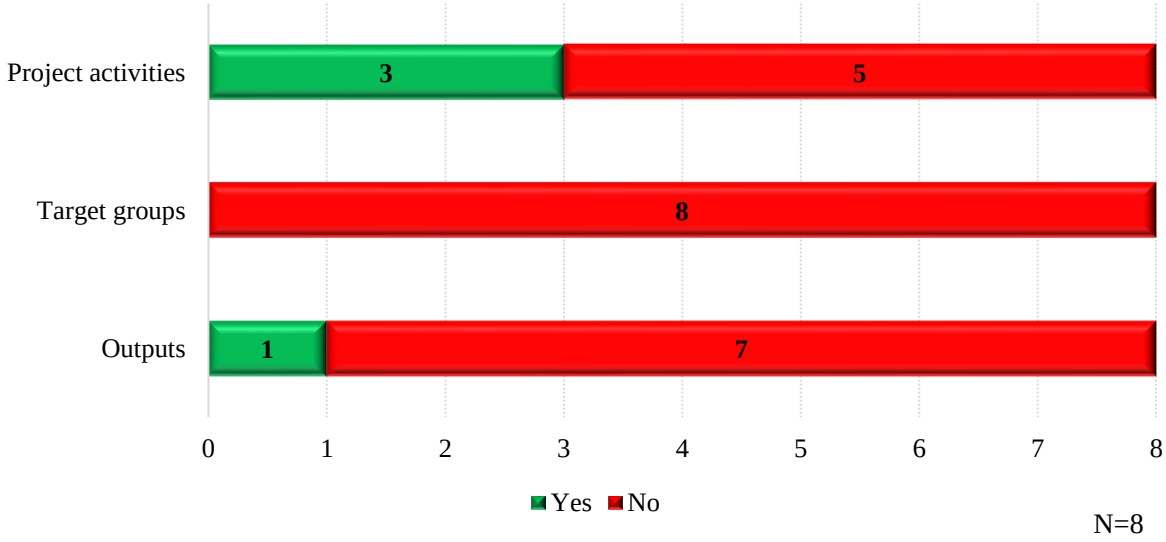
Requested Support	**Co-Innovate**	*"The project was granted a six-month extension on the 10th March 2020 due to not anticipating the effects of Brexit. However, COVID has subsequently made cross-border collaboration particularly difficult. Also, intern recruitment is very difficult and employing new interns as staff are on furlough or being made redundant is not desirable.* *As a result, we requested modifications concerning how the project is delivered, for example. to be more flexible. Around half of those have been approved, while some are still being considered by SEUPB. For example, in strand 4, an idea was put in place for projects that had been put on hold due to COVID-19 lockdown, partners could extend the project LoO end date to accommodate for the months lost as long as they can be completed within the timeframe of the programme (Approved by SEUPB). A 6-month extension was previously granted in March 2020."*
	Bryden Centre	*"An extension request was planned before COVID-19, but the pandemic has reinforced the need for an extension."*
	CPM	*"We requested additional personnel at no additional cost. The cost would be covered by an underspend in salary and movement from other categories. The PhD students that are due to finish in late 2020/early 2021 will also require an extension."*
	SPIRE 2	*"Flexibility in the budget."*
	NWCAM	*"Whilst not specific to any COVID-19 requested support, I would like to highlight the outstanding support that NWCAM received from SEUPB's communication team. They helped NWCAM with social media, content support, EU award submission support, UK Royal Academy of Engineering Award support and NWCAM article advice. They were readily available throughout lockdown and were a great source of encouragement, support and partnering which was very much appreciated during such challenging times."*
Beneficial Support	**SPIRE 2**	*"Support for press releases and any further advice as to the types of actions that can be taken would be welcomed. Other organisations are funding PhD extensions (e.g. DfE and UKRI), so we are hopeful that SEUPB will offer similar support."*
	NWCAM	*"An extension to the project timeframe has only been discussed so far. An extension would be a beneficial form of support, even as a non-cost extension."*
	Bryden Centre	*"Students may need additional time and budget to finalise their work. We note that UKRI is providing additional funding to their supported projects."*
	BREATH	*"Depending on the number of PhD students who require extensions, we may need to request additional funding from SEUPB to support PhDs beyond their scheduled finishing dates in 2021.* *If travel restrictions persist until the end of the project, we anticipate that the travel and conference budget and budget for the closing meeting may be underspent by €45,000 by the end of 2021. We would request that any such funds may be reallocated to support PhD projects beyond their scheduled finishing dates"*

One project lead (BREATH) indicated that before the onset of the COVID-19 pandemic the project had applied for additional funding to support the collection of clinical samples, however, it is understood that SEUPB is still considering the application.

2.6 Potential Adaptations to project activities, target groups or outputs

3[48] (of 8) projects suggested that they had adapted their project activities as a result of the Covid-19 pandemic. One of these projects had also adapted their project outputs.

Figure 2.8: Have you or do you intend to adapt project activities, target groups and outputs?



Projects made adaptions to their project activities and/or outputs by refocusing activities, cancelling, or rescheduling activities.

Table 2.5: Changes made or intended to be made (N=3)		
	Adaptations already made	**Intended adaptions**
Rescheduled activities	1	-
Cancelled activities	2	-
Refocused activities	2	-

ECME	*"We have changed the focus of our mini-projects from cardiac to COVID-19-specific projects in the World Health Organisation priority areas (e.g. data analytics, testing, PPE etc.), and the projects will potentially be more impactful than the originally planned activities. Further information on the mini-projects can be accessed on the project's website.[49]"*
NWCAM	*"Some projects may not be able to carry out testing, but we are in the process of reviewing the work and realigning their time, focus and capacity. Training has been reorganised to online entrepreneurship training for NWCAM students, we wanted to do local projects people could relate to."*
Co-Innovate	*"We have taken workshops online, as well as conducting BSRs and innovation audits via online and telephone. The preference is face to face, but we needed to make changes to maintain some movement."*

Despite some of the respondents stating that they do not currently intend to adapt project activities, target groups and outputs, it was highlighted that this may change as the COVID-19 pandemic progresses.

Other points to note include:

- SPIRE 2 indicated that whilst their outputs will not change, the enterprises involved may change depending on how COVID-19 effects them when furlough and other government support ends.

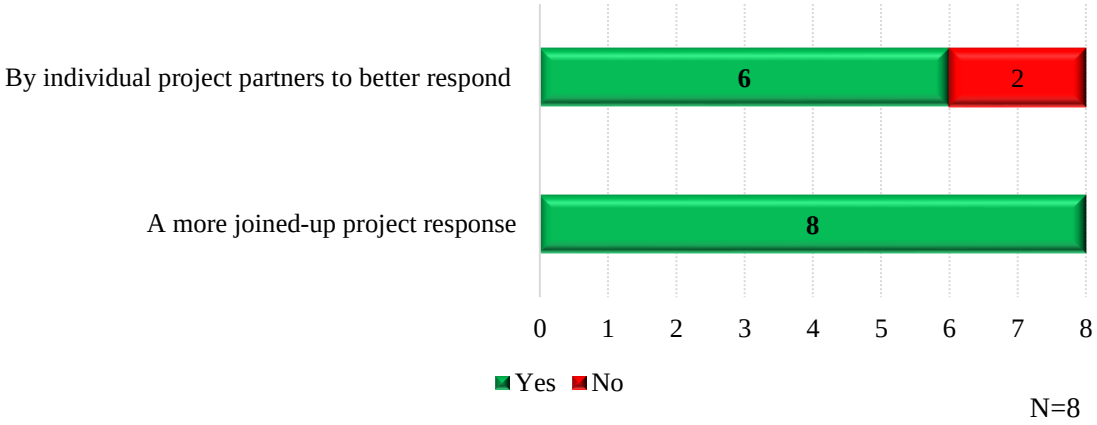
[48] ECME, NWCAM, and Co-Innovate
[49] *https://www.ecme-research.com/home/mini-projects-home-page/*

- CPM highlighted that they have not and do not intend to adapt their project activities, target groups or outputs, but as a result of the pandemic the Department of Health is now more involved in the project, which is viewed as being a positive development.

2.7 Cooperative measures implemented

All (N=8) of the project leads indicated that their project partnership had implemented cooperative measures to enable a more joined-up project response, whilst 6[50] (of 8) project leads also indicated that they had implemented cooperative measures to enable the individual project partners to better respond to the pandemic.

Figure 2.9: Cooperative measures implemented



Examples of cooperative measures implemented include:

- More regular communication and virtual/remote meetings;
- Sharing of advice and knowledge; and
- More training and development opportunities offered online.

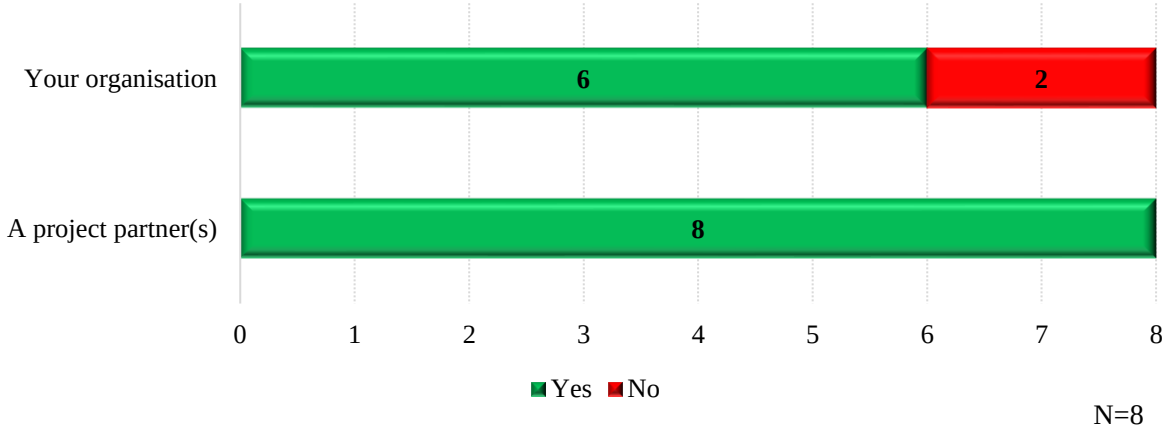
Co-Innovate	*"We changed how we approve projects under Strand 5. Before it typically would have taken 5-6 months to approve a project but now it takes 1 month as a result of the help from SEUPB."*
Renewable Engine	*"PhD students have been involved in manufacturing PPE. We organised remote project board meetings to develop a response to the position of all project partners."*
CPM	*"WHSCT and UU have been working closely together throughout the project and in particular throughout the COVID-19 pandemic as CPM has been heavily involved with the WHSCT COVID patients. We are providing a more joined-up project response through regular contact and meetings."*
ECME	*"Industry partners provided expertise, advice and knowledge to help adapt to COVID-19. Project staff had placements in industry and hospitals during the pandemic."*
SPIRE 2	*"The research institutes are working together. They are in touch online whereas before the plan was to hold meetings on-site. As far as possible we are keeping the project going. We do not want to push the companies as they have to survive through this crisis, so we have provided them with a lot of freedom and online support."*
BREATH	*"We have engaged in an extensive series of Zoom and TEAMS meetings both internally and with partners. This has enabled management and finance meetings, scientific meetings, conferences and industry-led training to proceed as normal. Video conferencing has been implemented quite well. Laboratory meetings continued to be held weekly online, as well as supervisory meetings with students. The training was delivered online. Students are in contact with each other across partners to plan to write literature review papers for potential publication."*

[50] Renewable Engine, SPIRE 2, NWCAM, Bryden Centre, Co-Innovate, and BREATH.

2.8 Direct Involvement in the Response to the Covid-19 Pandemic

All eight project leads indicated that their organisation or one of their project partners had been directly involved in the response to the emergency (beyond actions relating to the project), with 6[51] (of 8) of the project leads' organisations directly involved in the response to the emergency.

Figure 2.10: Directly involved in the response to the emergency



Examples of how the lead organisations and their project partners have been directly involved in the response to the emergency (beyond actions relating to the project) included:

- Involvement in the development of track and trace applications;
- Involvement in research activities related to COVID-19 (e.g. for a vaccine, antibody testing);
- Development of a COVID-19 dedicated website offering advice for businesses;
- Manufacturing of PPE or the respiratory part of the ventilator; and
- A Respiratory Physician was actively involved in managing the pandemic.

Co-Innovate	*"ITI and partners are delivering help on the COVID recovery. For example, InterTradeIreland (ITI) has created specific COVID-19 support through the E-Merge programme which provides £2,500/€2,800 fully-funded consultancy support to help businesses develop online sales and eCommerce solutions."*
Renewable Engine	*"PhD students from Sligo were involved in manufacturing PPE."*
CPM	*"Due to strong collaborations between academic and clinical staff, they have been able to work quickly and effectively to deal with any negative impacts and find solutions and/or pivot activities towards COVID where required. This has further strengthened collaborations between these groups and CPM enterprise organisations can stay on top of any developments / potential opportunities. CPM researchers worked closely with policymakers including the Department of Health and Public Health Agency NI, on several initiatives such as tracking and tracing developments, modelling impact and response, offering advice and developing testing initiatives.* *Specifically, UU has contributed towards the fight against COVID providing much-needed information to policymakers and health service personnel (e.g. COVID-19 Tracker (https://niCOVIDtracker.org/ which includes the curation of publicly available data at an all-Ireland level (cases, deaths, and mobility), development of a Contact Tracing System). Whilst Letterkenny has been involved in the mask consultations. The PhD has been involved in clinical work and redirected into the hospital. Also, two new studies were proposed that were linked to the CPM work and would require input from existing and new staff. The projects were Serological Epidemiology Study (SECROMNI) and COVID Response Study (COVRES)."*
ECME	*"Staff have been working on the front line in hospitals, working in organisations testing and some placements were also on the frontline."*

[51] CPM, ECME, SPIRE 2, NWCAM, Bryden Centre and Co-Innovate.

SPIRE 2	*"One of our enterprise partners developed a hand washing system that is deployed without any need for plumbing facilities. Another partner worked with the Irish Government on their track and trace application, but I do not think they went with it in the end. Also, COVID-19 research is ongoing in the research institutes.* *Ulster University and Queen's University Belfast also carried out on-campus antibody testing with the student population. With University students coming back soon it is going to be hard to handle, especially with freshers' week. However, one-way systems have been put in place."*
NWCAM	*"Catalyst set up a new website[52] solely focused on COVID-19 to help businesses navigate through information conveyed through the press. Various webinars were also hosted and delivered by Catalyst. We spoke to local tenants about what they wanted to know and invited experts to talk about the issues.* *Our partners have done a raft of stuff. NuPrint and UU Magee produced PPE (up to 200,000 pieces per day) by repurposing the equipment and 3D visors. Letterkenny Institute of Technology repurposed NWCAM equipment to produce face masks for Altnagelvin Area. Abbott worked on COVID-19 testing equipment. GSK Stiefel was involved in rapid diagnostics and testing, and also produced and packaged 5,000 litres of hand sanitiser that was donated to the HSE, local charities, local healthcare providers and An Garda Siochana. Causeway Sensors planned to illuminate existing measurement blind spots and yield high quality, rapid label-free analysis, helping the industry to accelerate its development processes. Axial 3D completed a raft of stuff and altered its core commercial capability and repurposed 3D printing capacity, including, 3D face mask printing, respiratory splitters, test kits, and valves for respiratory equipment. Denroy Plastics Ltd collaborated with Crossen Engineering Ltd (Lisburn) to produce and distribute Hero Shields (1million). Armstrong medical worked on the respiratory part of the ventilator and increased their workforce to manufacture the products."* Please note that further details of NWCAM's partners' response to COVID-19 are detailed in Section 3.5.
Bryden Centre	*"QUB was involved in developing and supporting the NI app, working on a vaccine, and supporting testing. I'm unsure of what partners have done but they would have contributed in some way."*
BREATH	*"We have a clinical lead, Prof Lorcan McGarvey who is based in QUB. He is a Respiratory Physician who has been actively involved in managing the crisis. We also have several Clinical Affiliates who are respiratory physicians. The clinical affiliates were brought in to enhance the project and were not in the original plan. They have been actively involved in managing the crisis and kindly participated as speakers in a series of COVID-19 based seminars delivered by MS Teams over the summer months. These seminars were of great interest to a programme like BREATH, which is targeted at COPD, a major respiratory disease. These conferences were well attended across the BREATH platform with up to 50 participants per session."*

2.9 Lessons Learned as a result of the Changing Circumstances

The eight project leads highlighted a variety of lessons/best practice that they have learnt when adapting their project to the changing circumstances. Examples included:

- The importance of having good IT infrastructure in place to enable remote working and online meetings to take place;
- The flexibility and convenience of online meetings;
- Appreciation for personal circumstances; and
- The need for greater engagement with students and the efficiency of communication.

[52] https://www.catalystCOVID-19.org/

Co-Innovate	*"We learnt how much contact and delivery can be carried out online which is a major benefit. The major benefit of not having to get on a plane or travel to meet is that 2-3 meetings can take place online in one day rather than 1, which is much more efficient and productive"*
Renewable Engine	*"We quickly learnt that we need to be agile in project plans and be able to change things quickly to adapt to the ongoing situation. We need to be flexible when we cannot get into a laboratory. We also learned that we could conduct meetings remotely and do not need to fly partners in, which was a major learning curve."*
CPM	*"The proximity of the academic and clinical facilities greatly facilitated collaboration between academics and clinicians. This is especially relevant under the circumstances of the COVID pandemic. Given the strong collaboration between academic and clinicians and the use of a shared space, they were able to lead and contribute to responses to COVID pandemic, pivot research activities towards COVID-19 responses where relevant smoothly and efficiently and seize opportunities for research into same to alleviate risks to the project. Also, strong collaboration and regular contact have been essential to ensure a coordinated response and knowledge of what everyone needs and wants."*
ECME	*"The lessons learnt include looking at emerging needs and being aware of the challenges, and how to use the resources. We learned to keep the project flexible enough to respond and adapt quickly."*
SPIRE 2	*"One major lesson learnt is trying to manage the uncertainty, we spend more time thinking "What if" than we would have in the past. We are trying to expand our risk assessment and identify what aspects of the project could be affected by COVID-19. One of our objectives involves using NI houses but people may not be keen to allow people into their houses. There is also the uncertainty of another wave holding us back."*
NWCAM	*"To have an appreciation for personal circumstances. In the past when organising a meeting we would have expected everyone to be there but that is no longer the case now. Now, we have to take people as they are available and run informal meetings. The exceptional circumstances that we all found ourselves in have affected everyone's mental health, and we now appreciate the importance of checking in with everyone, even if it is just through grabbing a virtual coffee… each of us sitting down with a coffee on zoom. These more informal meetings have decreased our project meetings from 2 hours to 1 hour, which is much more efficient.* *Each of the project partners set up MS Teams at the start which has allowed everyone to keep in regular contact, especially the students. All of the partners now appreciate the need to be flexible and we all now negotiate and agree tasks and responsibilities so there is no more 'that is not my job', and it also means we are all exposed to new learning experiences and given insight into other people's roles. We appreciate that we need to help each other to work towards a collaborative goal with the recognition we are all equal partners and all hoping to succeed together."*
Bryden Centre	*"Supporting the mental health of the students - There has been greater engagement across the institutions through virtual meetings. Each institution interacted and kept its policy in the care of students. Students came to us at Bryden for a consistent and coordinated response."*
BREATH	*"We have improved our knowledge and efficiency of communication by virtual means and have realised that there are many advantages in this, as well as some obvious disadvantages. A WhatsApp group was set up for communication, as well as Zoom and TEAMS. We have also learnt that a shorter working week in the labs, as is our current practice, does not necessarily reduce productivity as the researchers tend to maximise their efficiency, whilst being aware of time limitations."*

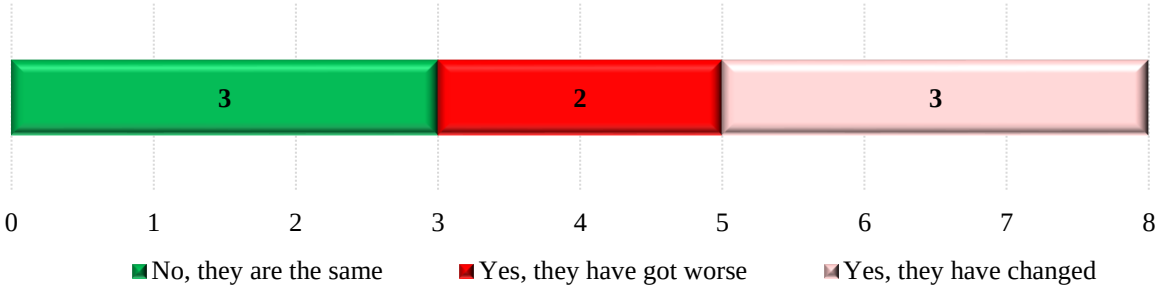
2.10 COVID-19 - Implications for Challenges Facing the Programme Area

Each INTERREG VA project was established to address specific challenges or needs in the eligible region, 3[53] (of 8) project leads were of the view that the COVID-19 pandemic had not impacted upon those challenges or needs in any way (i.e. the challenges are still the same). Albeit one[54] of the lead partners noted that they will not know for a few years what impact COVID-19 has had on COPD.

However, the remaining project leads indicated that the COVID-19 pandemic has impacted upon those challenges or needs, as follows:

- 3[55] project leads suggested that the nature of the challenges or needs had changed; and
- 2[56] project lead noted that the challenges or needs had worsened.

Figure 2.11: Impact on challenges or needs in the eligible region



N=8

Projects noted the following:

The challenges have got worse	**ECME**	*"COVID-19 has created a big challenge as there is a need for digitisation of the health service, but it is very hard to make these sorts of changes. Despite this, there is increased opportunity to create change and the relevance of the project has increased."*
	Co-Innovate	*"As a result of the pandemic, businesses were and continue to prioritise survival over-investing in R&D, which has ultimately lessened the number and capacity of SMEs engaged in cross-border research and innovation activity. We are hopeful that businesses focus will change in the coming months."*
The nature of the challenges have changed	**SPIRE 2**	*"As mentioned previously, companies are focusing on survival rather than the activities on the project, and what was a priority several months ago is no longer a top priority. Despite this, the COVID-19 situation may accelerate the move to green technology, as it could move the green agenda on. A report released during the lockdown; Green Jobs compared to Infrastructure jobs provided an example that a job in home insulation can be created for £59,000 rather than a road maintenance job at more than £250,000. Boris Johnson recently spoke about the new Green Deal, and it could move the objectives of the project on due to self-sufficient housing."*
	NWCAM	*"The emphasis has changed in that encouraging businesses engagement in R&I, particularly on a cross-border basis, is more important now than ever. The pandemic has increased the need to be competitive in the eligible region as it is even more important to drive the economy. We need more collaborative R&D and recognition that 'no man is an island'. We need to collaborate locally by tapping into the local talent and this would serve to increase productivity and economic output amongst SMEs."*
	Bryden Centre	*"We have had greater engagement and activity with DfE and the NI Executive since the onset of the COVID-19 pandemic. The challenges in our area have all changed for the better."*

[53] Renewable Engine, CPM and BREATH.
[54] BREATH
[55] Bryden Centre, NWCAM and SPIRE 2.
[56] ECME and Co-Innovate.

2.11 A Future Programme's Potential Contribution to Recovery

The project leads identified the following ways in which a future programme could contribute to the recovery from the pandemic:

- Ensuring there is a greater focus on green initiatives;
- Taking cognisance of COVID and the importance of research into pandemics/influenzas;
- Targeting growth areas in MedTech;
- Ensuring a more cohesive link between businesses and local research institutions.

Co-Innovate	*"The projects would need help with recovery and growth competitively, looking at opportunities for what was done in the past and deciding if it is still relevant for the future."*
Renewable Engine	*"Politicians are always talking about rebuilding the economy on green initiatives. A future programme could focus on projects in this area as a lot of industry is shifting to this."*
CPM	*"A future programme could recognise the increased importance of pandemics and flu and take into consideration the outputs that will affect blood results."*
ECME	*"A future programme will need to target growth areas in MedTech and the economy needs to be aligned to these. For example, Artificial Intelligence relates to healthcare, at-home monitoring and sensors. We need to stay ahead of the curve and get ready for that."*
SPIRE 2	*"The likes of smaller-scale field trials, such as retrofitting houses and implementing technology. Looking into developing these into a social enterprise or helping companies navigate the area."*
NWCAM	*"There need to be greater links between business needs and local research talent. There is a need for something in which business research problems that cannot be addressed by businesses in isolation can get help. The link between industry and research institutes for specific business needs would assist with economic recovery. Northern Ireland needs to focus on this to exploit what we can do to help us recover. A greater link will lead to more jobs and more wealth in the NI Economy."*
Bryden Centre	*"Clean energy space is growing, and we want to support that. The links between energy and manufacturing are growing and there is an opportunity for growth in terms of jobs and wealth. Air quality and emissions are strongly correlated, decreased emissions have a positive effect long-term, as it decreases pollution levels."*
BREATH	*"BREATH, fortunately, has a strong clinical component and a strength of the programme is the collaboration between clinicians and scientists. The clinical network has been extended significantly beyond our initial plan and is a platform that we can build on in the future. As these clinicians are respiratory specialists and the scientists are focused on airways diseases, this is a strong basis for building a future COVID-19 based strand into our research. This strand also extends to our collaboration with Almac Discovery, our new Industrial Partner, who will also focus on COVID-19."*

3. NWCAM - NORTH WEST CENTRE FOR ADVANCED MANUFACTURING

3.1 Introduction

This section of the report considers the North West Centre for Advanced Manufacturing (NWCAM) project, which was awarded grant funding under Priority Axis 1a – Enhancing Research and Innovation, Specific Objective 1.1 – Increasing business and industry-relevant research and innovation capacity across the region.

3.2 Project Overview

The North West Centre for Advanced Manufacturing (NWCAM) project aims to create an Advanced Manufacturing supercluster combining the collective and complementary strengths of the Engineering Research Institute at Ulster University; the James Watt Nanofabrication Centre at Glasgow University; the PEM Centre at Sligo Institute of Technology; and CoLab at Letterkenny Institute of Technology; co-ordinated by Catalyst Inc.

The project's design is based on leveraging collective academic strength in the area of Advanced Manufacturing and applying this to support the level of R&I undertaken by companies predominately located in the North West area of the eligible region[57].

This will see the development of a virtual cross border Centre for Advanced Manufacturing with a focus on four thematic areas[58] for application within the Health and Life Sciences Sector:

1. Sustainable Manufacturing;
2. Advanced Polymers;
3. Additive Manufacturing; and
4. Nano Manufacturing.

This virtual Centre will span the Region but operate out of the North West; thereby seeking to redress the underinvestment in R&I in this part of the Region; and provide access to cutting edge research expertise to several Tier 1, 2 and 3 companies located there. Eight industry partners have been identified, consulted and participated in the co-design of the proposed research programme, together with the academic partners.

NWCAM is led by Catalyst Inc (the trading name of Northern Ireland Science Park Holdings Ltd) and involves several academic and industrial partners, including:

Academic Partners	Industrial Partners / Beneficiaries[59]	
• Catalyst Inc (Lead Partner); • Ulster University (Lead Academic Partner); • University of Glasgow; • Institute of Technology Sligo; • Letterkenny Institute of Technology; • Derry City and Strabane District Council.	• Abbott; • Armstrong Medical; • Laser Prototypes Europe; • GSK Stiefel; • Leckey	• Nuprint; • Denroy Plastics Ltd; • axial 3D; • Causeway Sensors; • Clyde Biosciences[60].

[57] For example: Nuprint; Sphere Global; Armstrong Medical; and Bemis Healthcare Packaging (all Derry/Londonderry); GSK Stiefel; and Abbott (both Sligo) and Randox (Donegal). In addition, it is noted that while C-I and UU have locations in the Greater Belfast area, both organisations are also located in the North West area of the Region: CI within the North West Regional Science Park in Derry / Londonderry; and UU at its Magee campus in Derry / Londonderry. It is understood that a significant element of the proposed investment will be directed to these locations.

[58] NB In order to help ensure success, the project partners considered that it was important that they selected those areas of advanced manufacturing, in which they had the most competence; and were the most relevant to the target sectors. On this basis, the NWCAM is concentrating efforts on a select number of advanced manufacturing competence areas, in which the academic partners were previously engaged in high level research activities.

[59] Other businesses that were initially engaged with the project included Randox Laboratories, Sphere Global and Bemis Healthcare Packaging.

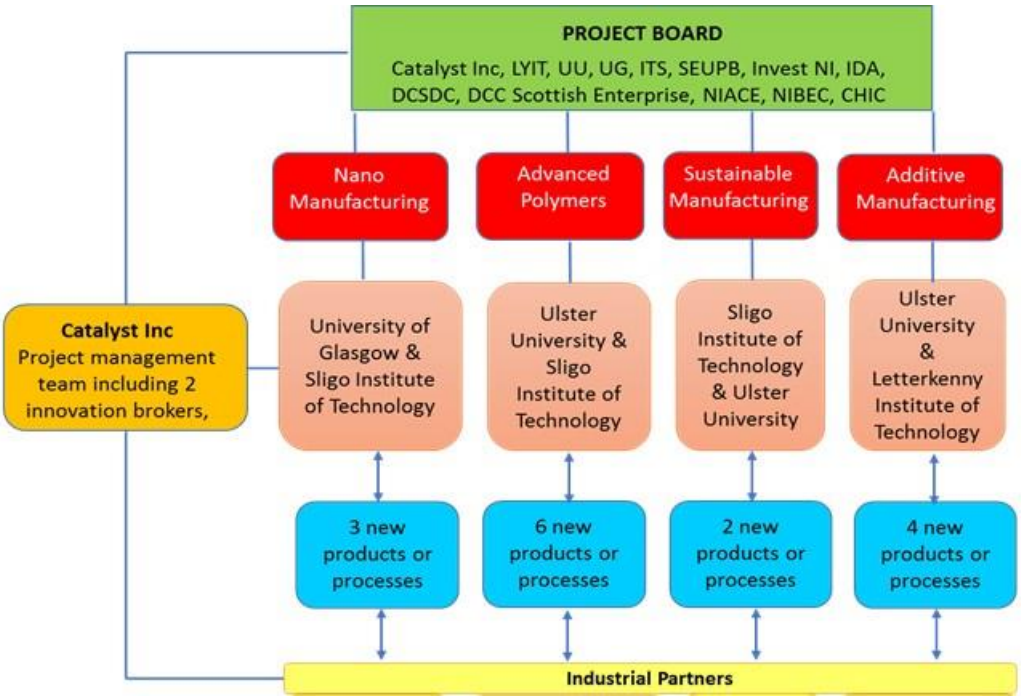
[60] A modification request to include Clyde Biosciences as an additional industrial partner/ beneficiary submitted in October 2019 was accepted in July 2020.

To achieve their project objectives, the project partners are anticipated to undertake the following activities.

- Co-ordination of Cross Border Research Team
- Management of 15 R&I Projects with 9 Regional Industrial Partners - The implementation of the projects will require the recruitment and management of 13 PhD students and 11 PDRA staff[61].
- Innovation Management Activities -
- Preparation of 30 peer-reviewed journal articles with cross-border authorship –

A diagrammatical overview of the NWCAM Project is presented below:

Figure 3.1: Overview of the NWCAM Project



[61] An overview of the 15 projects was provided in the first evaluation report.

3.3 Project Expenditure to December 2020

The NWCAM project received a Letter of Offer (dated 21st June 2017) offering a grant of up to a maximum of €8,518,406.33 (ERDF + Government Match Funding) to be expended and claimed by 31st December 2021, towards total anticipated project costs of €8,779,853.06.

As of December 2020, the project had reported total estimated expenditure of €5,380,508, equivalent to 61% of the total project budget. The original projected spend for the same period estimated that 81% of the total project budget would be incurred at this time.

Table 3.1: Project Costs – Anticipated and Estimated Actual December 2020 (€)

Summary Budget	Anticipated Total	Actual to March 2020 Per Project Progress Report[62]	Reported to JS by First Level Control (FLC)	Pipeline Expenditure (excluding items deemed ineligible by FLC)	Total Estimated Expenditure in December 2020[63]	% of total budget
Staff Costs	4,616,796	2,187,951	2,469,380	253,818	**2,723,198**	59%
Office and Administration Costs	1,715,378	829,968	949,593	103,639	**1,053,233**	61%
External Expertise and Services	1,725,255	787,147	981,207	116,333	**1,097,540**	64%
Travel and Accommodation Costs	111,517	65,433	67,840	28	**67,868**	61%
Equipment Costs	610,907	380,973	390,227	48,443	**438,670**	72%
Total	**8,779,853**	**4,251,472**	**4,858,247**	**522,261**	**5,380,508**	**61%**
Original projected spend level[64]					**7,116,442**	**81%**

[62] Source: Project Progress Report 12 – 'Total reported'. This was the most recently available collated project progress report.
[63] Source: SEUPB's EMS 14th December 2020
[64] Source: SEUPB's EMS 14th December 2020

3.4 Contribution to the Priority's Specific Objectives and Result Indicators

This section considers the NWCAM project's key achievements and the extent to which the NWCAM project has:

- Contributed to the achievement of the Priority's Specific Objectives; and
- Contributed to the achievement of the targets for the Result Indicators.

The section also identifies any external factors that have impacted, positively or negatively, on the project's ability to contribute to the achievement of the Specific Objective.

3.4.1 Key Achievements (to June 2020)

The NWCAM project partners cite the project's key project achievements (between January 2019 and June 2020[65]) as being:

Table 3.2: Key Achievements

Period	Dates	Key Achievements/Points of Note
8	1st January 2019 – 31st March 2019	• Good communication amongst project partners and a sustained commitment to common goals continued to support the delivery of the project through collaborative engagement demonstrated by project meeting contributions. In addition to this, there was a willingness to participate in marketing and communications activity for the project illustrated by press articles and ongoing event attendance and sharing of knowledge by the attendees to the wider network within NWCAM. • All work plans progressed well albeit with some delays due to later recruitment of dedicated research staff, as a result of lengthy recruitment processes within the Universities and also some changes of staff which delayed some activities being fully completed. • Researchers engaged well with the industrial partners many of which were developing strong relationships through NWCAM, these businesses were proactively advocating research and development participation and highlighting the benefits to their company through EU funding and local researcher and Catalyst support.
9	1st April 2019 - 30th June 2019	• Catalyst continued its project governance role and developing the consortium through several project meetings alongside participation in strategic workshops to design the future of NWCAM. • The further strategic development of NWCAM was investigated through key events and workshops which included the Foyle Smart City conference, NIConnected Health Ecosystem event, Future of Work Summit, Irish Med Tech event, cluster development within NI with key research centres and others. • SEUPB communication and marketing training was attended by the Project Manager and Project Administrator. This allowed for networking with other INTERREG projects and provided training to help improve the effectiveness of communication and outreach activities delivered by Catalyst and NWCAM partners. • Marketing during this quarter included an article placed in Life Sciences Scotland to highlight all the NWCAM work plans ongoing with the University of Glasgow. • NWCAM attended and presented a banner at the NI Connected Health Ecosystem event, LYIT Engineering expo day to showcase LYIT research and industry engagement, Ulster University Festival of research (where NWCAM PhD student won the best presentation), and Catalyst attended "Manufacturing the Future" Conference on June 19 (NWCAM PDRA won the best project).

[65] Please note that the key achievements have been documented in respect to the most recent Project Progress reports that were available to the Evaluation Team at the time of writing.

Table 3.2: Key Achievements		
Period	**Dates**	**Key Achievements/Points of Note**
10	1st July 2019 – 30th September 2019	• A press release was issued for Axial 3D and their R&I journey with Catalyst and their ongoing research work supported by INTERREG VA. • IEEE conference was organised and hosted by Glasgow Uni with NuPrint co-sponsoring attendance along with Innovation Broker support.
11	1st October 2019 – 31st December 2019	• The lead academics continued to work with the industrial partners and PhD students. All work plans were continuing well with key outputs achieved in terms of preparing academic journals and conference papers.
12	1st January 2020 – 31st March 2020	• The onset of the COVID-19 pandemic created new opportunities for the NWCAM consortium to pull together and support each other. The connections within the cluster between academic, industrial and lead partner staff were more evident during the time of the pandemic. • The research-based themes made significant progress with several patenting discussions held and patent and design checks explored across a number of different industrial partners including Armstrong Medical and NuPrint.
13	1st April 2020 – 30th June 2020 (from partner progress reports)	<u>Catalyst</u> • Governance had been very active to maintain open lines of communication and to share progress, challenges and opportunities during the Covid-19 lockdown period. • Communication from NWCAM continued with several articles produced and issued to promote both the project as a whole and specific NWCAM partners highlighting their efforts in the battle against Covid-19. NWCAM featured in the EU Summer SEUPB magazine where the Life and Health Sciences Survey was highlighted. For external promotion, a detailed article was written and published to highlight the efforts of all the NWCAM partners and detailed their specific contribution during the global pandemic. • Promotional work in the form of competition entry had been active. This has included entering NWCAM into the European wide Regiostars competition; this was entered based on the innovative structure of NWCAM with independent lead and commercialisation focus of the R&I virtual cluster. In addition to this, a UK wide competition run by the Royal Academy of Engineering was entered - NWCAM entered the President's special award for Pandemic service, with letters of support from SEUPB and Professor Norman Apsley. <u>ITS</u> • Due to the Covid-19 situation and the Irish Government directive regarding social distancing and travel restrictions, postgraduate students were not allowed on to the campus and staff access was very restricted to exceptional circumstances only. Also, a new PDRA's start date was postponed to August. • Abbott's attention moved to business-critical priorities and COVID-19 disruption mitigation measures; they were still very much supporting the NW project albeit remotely. <u>LYIT</u> • COVID-19 had a more significant impact than initially envisaged. LYIT's lab space was taken over by the Gardai to coordinate their COVID response teams. The industry partner also stopped their operation. • The LYIT team completed development of software for the pressure sensing system and its app interface. Desk-based research had identified potential areas of future research into alternative pressure sensing techniques. Online meetings were held with the industry partner to reopen discussions about product development. <u>UU</u> • PDRAs and PhD students provided information on individual project progress and focused on completing reports aligned to project objectives. • Work with the period was focused on market analysis studies, design and simulation activities and modelling/DOI aspects if based on manufacturing/testing.

3.4.2 *Progress towards the Project's Output Indicators*

Table 3.3 provides a high-level summary of the progress that has been made by the NWCAM project towards its Output Indicators.

Table 3.3: Progress towards Output Targets

Output Code	Description	Programme target		NWCAM target	Progress as of September 2020[66]	Variance against project target	Commentary
CO01	Number of enterprises receiving support	20		8	9	+13%	**Proceeding according to the project work plan.** 9 businesses are currently engaged across 15 research projects. The businesses include Abbott, Armstrong Medical, Laser Prototypes Europe, GSK Stiefel, Leckey, Nuprint; Denroy Plastics Ltd; axial 3D and Causeway Sensors
CO02	Number of enterprises receiving grants	10		2	4	+100%	**Proceeding according to the project work plan.** An open call for applications was issued to fund industrial projects up to a value of c.€50k. 4 applications were received and were assessed by an independent panel consisting of Invest NI, Enterprise Ireland, Interface, Highlands and Islands Enterprise, Ulster University and Derry City and Strabane District Council (DCSDC). All four applications were all deemed to be eligible, passing the minimum assessment thresholds that were established and LoOs were issued to all 4 applicants.
CO04	Enterprises receiving non-financial support	20		8	9	+13%	**Proceeding according to the project work plan.** As above 9 businesses have received non-financial support through the 15 research projects.
CO24	Number of new researchers in supported entities		T1.3.1	29.50	52.05	-47%	**Proceeding according to the project work plan.** Research years are anticipated to increase as the research projects continue to be taken forward. Delays in the recruitment of PhD students and changes to the student profile has hindered the progress towards this target to date.
			T2.3.1	25.50			
			T3.3.1	21.50			
			T4.2.1	13.00			
			T6.1.1	9.00			
		514		**98.5**	**52.05**	**-47%**	
CO26	Number of enterprises cooperating with research institutions.	10		8	9	+13%	**Proceeding according to the project work plan.** As above, 9 businesses are currently engaged across 15 research projects.
CO41	Number of enterprises participating in cross-border, transnational or interregional research projects.	10		8	9	+13%	
CO42	Number of research institutions participating in cross-border, transnational or interregional research projects.	5		4	4	-	**Proceeding according to the project work plan.** Four academic institutions (UU, IT Sligo, LyIT and UG) are actively involved in the delivery of the project's research projects.

[66] Source: SEUPB's quarterly monitoring data.

3.4.3 Target Groups Reached

Table 3.4 provides an overview of the target groups researched as a result of the Project's activity to March 2020.

Table 3.4: Target Groups Reached (March 2020[67])			
Target Groups	**Target Value**	**Target Groups Reached**	**Notes**
Higher education and research	-	4	The four Academic partners are continuing to actively support and co-ordinate research staff and students to carry out the activities associated with their work plans and address the needs of the outputs of the project.
Enterprise, excluding SMEs	-	3	The Innovation Brokers were actively reinforcing enterprise engagement with a variety of meetings, conference calls and email contact.
SMEs	-	7	Seven SMEs were partnering on NWCAM, including Leckey, Armstrong Medical, Laser Prototypes Europe (LPE), Nuprint, Causeway Sensors, axial3D and Clyde Biosciences. Each of the SMEs had accepted the Partnership Agreement and signed the Annex 10 to agree to the terms of research ownership.

3.4.4 Progress towards the Project's Result Indicator Targets

Per Table 3.5, it is anticipated that the NWCAM Project will contribute 30 peer-reviewed journal and conference publications within the Health and Life Sciences Sector with cross-border authorship.

Table 3.5: Progress towards Result Indicator Target			
	Programme target	**NWCAM Target**	**Progress (at August 2020[68])**
Peer-reviewed journal articles with cross border authorship	75	30	2

As of August 2020, the project had finalised 2 peer-reviewed journal and conference publications with cross-border authorship.

3.5 Impact of COVID-19

As reflected in Section 2, key findings related to the impact of COVID-19 on the NWCAM project include the following:

- Despite the progress made (see Section 3.4), the restrictions associated with the COVID-19 meant that:
  - Various staff across the lead partner's organisation, project partners or direct beneficiaries started working remotely and/or had furloughed staff. This includes Glasgow University furloughing staff, which had an impact on the number of research years for that period;
  - Several industrial partners had furloughed staff that were involved in their R&I projects. However, there is a requirement for both research and industrial partners to be fully operational to progress the co-designed projects.
  - The project's academics continued to engage with PDRAs and PhD students and with NWCAM partner companies through Skype/Zoom to provide project updates;

[67] Source: Project Progress Report 12 – 'Total reported'. This was the most recently available collated project progress report.
[68] Source: Consultation with project lead (26/08/2020).

- However, the project lost access to laboratories across each of the academic partners, and to testing and development sites (within the industry partners) has had a substantial impact on project progress. Whilst some PhD students had already completed sampling and testing and therefore were able to work from home, however many had not;
- Nonetheless, some activities have been able to progress remotely including:

  - Identifying opportunities for cross border paper content and forecasting potential collaborations to meet project targets
  - Drafting reports aligned to the project objectives
  - Remote and desktop simulation and modelling work, and design-related activities
  - Desktop work focused on market analysis studies, design and simulation activities, data modelling activities, conference/journal preparations including literature reviews, methodologies etc. rather than data gathering.

  Indeed, the project notes that remote working on plasmonic bio-sensors will concentrate on theoretical and simulation work for the foreseeable future; which they consider will add to their understanding of experimental results and future design, thus contributing strongly to the success of the project.

- Project expenditure has reduced as travel was not allowed. Nonetheless, the partnership anticipates that all of the project budget will still be required, albeit it has been delayed.
- To adopt a 'unified sense of purpose', the businesses and innovators within the NWCAM ecosystem changed their 'normal' working patterns to focus on repurposing their manufacturing capabilities in response to the COVID-19 pandemic. Examples of the project partners' and beneficiaries' involvement in the response to the emergency (beyond actions relating to the project) (at August 2020) are detailed below.

Armstrong Medical	Armstrong Medical, a specialist manufacturer of breathing and respiratory products has scaled up its capacity and substantially increased their workforce to manufacture disposable breathing circuits and electromedical devices for Intensive Care Units (ICUs) to meet global demand. Recently they launched a range of products including the AquaVENT VT breathing circuit which incorporates some of the research & development (R&D) generated from the NWCAM collaboration with Ulster University.
Axial3D	Pivoting from Artificial Intelligence (AI) and 3D anatomical modelling, Belfast based Axial3D has altered its core commercial capability and repurposed 3D printing capacity to print much-needed parts for ICU ventilators, as well as COVID-19 test kits and masks for the National Health Service (NHS) and the Health and Safety Executive (HSE). In response to the personal protective equipment (PPE) shortage, Axial3D teamed up with Sports Fusion, a leading UK sports-tech company to crowdfund £20,000, enabling the rapid production and direct shipping of protective face shields to front line staff.
Causeway Sensors	Causeway Sensors is a QUB spin out working in partnership with the Universities of Ulster and Glasgow to develop a novel sensing platform which could revolutionise drug discovery and production in the biopharmaceutical industry. Using nanostructured technology, it will illuminate existing measurement blind spots and yield high quality, rapid 'label-free' analysis, thereby helping the industry to accelerate its development processes. The project partners consider that this technology could potentially be a game-changer in supporting the scaling of COVID-19 vaccines and therapeutic production. *"We are exploring how our platform can be adapted to accelerate the development of vaccines and therapeutic antibodies needed by society to respond to COVID-19,"* Bob Pollard, CEO of Causeway Sensors.
GlaxoSmithKline (GSK)	GlaxoSmithKline (GSK) one of NWCAM's largest industry partners is playing a pivotal role in the search for COVID-19 vaccines, therapeutics and testing. GSK is collaborating with companies such as Sanofi and research groups across the world working on promising COVID-19 vaccine candidates. Together with Sanofi, they are using their innovative vaccine adjuvant (A pharmacological or immunological agent that improves the immune response of a vaccine)

	technology which reduces the amount of vaccine protein required per dose, allowing for faster scaling and greater production of the available vaccine. GSK is expected to enter clinical trials in the second half of 2020 and if successful they aim to complete the development required for availability by the second half of 2021. GSK and Sanofi combined have the largest vaccine manufacturing capability in the world and if successful, will have the capacity to manufacture the hundreds of millions of doses that are likely to be required worldwide. GSK Sligo also produced and packaged 5,000 litres of hand sanitiser that was donated to the Health Service Executive, local charities, local healthcare providers, and An Garda Síochána (police).
NuPrint Technologies	Irish design and print specialist NuPrint is retooling and focusing on large scale automated manufacturing to produce up to 200,000 pieces of protective equipment a day, (including customisable CE certified face shields) to help alleviate and fill the demand needed for frontline healthcare workers to feel safe as they help others. The team is engaging with Ulster University, Magee to develop the new manufacturing systems and processes needed to combat the PPE shortage.
Denroy Plastics	Denroy Plastics has been working with a consortium of local businesses to design and manufacture the Hero Shield, a plastic protective visor to guard the face. Denroy recently took over distribution of Hero Shield face shields along with Crossen Engineering Ltd. and have been delivering orders to healthcare workers on the front line as part of the COVID-19 response. Over the next few months, Denroy will deliver over 1 million Hero Shields through the NHS and HSE.
NWCAM Academic Partners	NWCAM academic partner, Professor Ravinder Dahiya from the James Watt School of Engineering at the University of Glasgow has developed a Do it Yourself (DIY) emergency ventilator for deploying primarily within low to middle-income countries or in remote settings. The team is now seeking additional funding and a potential industry partner for further development of the prototype to rapidly take to market. Another leading Glasgow researcher, Professor Nikolaj Gadegaard and his team have been manufacturing PPE at scale, producing 500 face shields per day and are now ramping up the production towards 1,000 per day ensuring local frontline staff have the necessary equipment. IT Sligo's Centre for Precision Engineering, Materials and Manufacturing Research (PEM Centre) have been scaling up their production of face shields since the beginning of April. Academic director of the PEM Centre, Dr David Tormey highlighted that precision engineering and additive manufacturing (better known as 3D printing) are core competencies of the Centre and the team were able to manufacture three types of face shields, differing in terms of material grade, geometry and design depending upon the required end-use. Having produced over 12,000 face-shields over seven weeks, all three models are being distributed to frontline staff in the HSE, nursing homes and care facilities. NWCAM supported principal investigator, Professor Alistair McIlhagger alongside teams in the Nanotechnology and Integrated Bioengineering Centre – NIBEC and the Department of Engineering, Ulster University are applying their expertise in 3D modelling and medical device design and fabrication to support the Southern Health & Social Care Trust to design and fabricate innovative respirator and aspirator cover prototypes which will be trialled by respiratory consultants to support patients and protect staff. Vita Materials are now mass-producing visors designed by the School of Engineering team. Ulster University is also rolling out a COVID-19 Antibody Trial App at their Jordanstown campus led by Tara Moore and Jim McLaughlin along with CIGA Healthcare. The engineering staff at Letterkenny Institute of Technology (LYIT) have been fully committed to the ongoing nationwide efforts to manufacture protective face shields. Repurposing equipment originally intended for electronics and mechanical engineering projects, LYIT engineers went into immediate production. Amid a campus shutdown, the team relocated their operations to a facility in Donegal Town and have delivered 520 face shields in the first week of production.

	"We are delighted to be able to produce the face shields. The valuable skills and expertise of our engineering staff have now resulted in a series of tweaks to the design to allow a quicker production cycle. We are thankful to those working on the frontline" Dr Jim Morrison Head of Department of Electronics and Mechanical Engineering at LYIT.

- Consequently, discussion with the NWCAM partnership indicates that:

  - NWCAM is behind schedule, with the project partnership of the view that there is a 'high risk' that the project will not fully achieve its aims and objectives. In particular, the partnership is of the view that the pandemic will jeopardise the expected output of the project due to reduced laboratory time;
  - It may not be feasible to deliver the project's planned activities within the original timeframe as some projects may not be able to carry out testing, due to research facilities having to close;
  - It may not be feasible to deliver the project fully within its current budget due to contracts having already been pre-paid to people working from home but unable to carry out the research. The project partners indicate that additional funding may be required to hire an additional researcher to help to make up for the lost research years;
  - There is a further risk to the project in the form of losing industry partners as a result of the economic downturn

- The Evaluation Team notes that discussion (during December 2020) with SEUPB's Joint Secretariat indicates that it is working closely with each of the Priority Axis 1 projects to establish the impact of the pandemic on their project and their potential requirements (e.g. project extensions). SEUPB's anticipates that it will receive formal feedback on these matters from each of the projects during early 2021. SEUPB's engagement with the NWCAM project partnership indicates that:

  - The project has encouraged the PhD students to look at online development courses/Webinars;
  - The project is developing new areas of online learning for PhD students;
  - Due to the loss of access to its laboratory, Glasgow intends to focus on theoretical work, modelling, and simulations of printed sensor devices on an 'offsite' basis;
  - The project has increased the number of Project Management Team meetings to ensure timely transfer of updates between partners to understand progress, obstacles and new risks to each project and each partner;
  - The project has sought to understand and share information with its industry partners of all government (UK and ROI) support for business including those offered by Invest NI, Enterprise Ireland, Innovate UK, Manufacturing NI, Chambers of Commerce, Hirani, SFI research funds, business fund/grants and the Catalyst Covid-19 website resources.
  - The project anticipates that a majority of deliverables will be delayed by 3 to 6 months depending on their nature and the duration of lock-down. Deliverables and outputs impacted most will be those that are directly related to industrial partner input, such as company visit reports, onsite data collection, onsite testing of prototypes and scheduling models.
  - However, as of November 2020, the project does not consider that any of its deliverables will not achievable provided work is not delayed significantly more than 3 to 4 months.
  - The likelihood of the project completing on time (i.e. by 31 December 2021) reduces the longer access to research facilities, partner engagement and R&I activities are in lockdown.
  - As such, the project anticipates a requirement for at least a 3-month extension and perhaps additional funding to allow for the extension.

3.6 Impact on Business and Industry

This section considers the impact of the NWCAM project on business and industry within the eligible region.

As might be expected given the interim nature of the project's implementation and the continued focus in carrying out the research aspects of the project, the tangible impact of the project on business and industry (in terms of generating outputs and outcomes) can only be measured in the longer term and will be a core focus of the Evaluation Team's next tranche of research. Notwithstanding this, the Project Partners note the following positive activities and outputs, which offer the potential to support the longer-term growth and competitiveness of the project's industry members.

- **Development of industrial competencies** - For example, NuPrint's competencies have been developed as a result of undertaking a pilot project with Altnagelvin hospital-based around smart labelling for secure patient information transfer;
- **Development of IP** - As part of the 'Development of insulated medical tubing with controlled gas barrier properties' research project, an assessment of the patent landscape had been conducted via Ulster University's technology transfer office and an invention disclosure relating to this project was assessed for patentability to file a UK patent application. The developed technology was licensed to the project's industry partner (Armstrong Medical) and they obtained regulatory approval for their new breathing circuit product 'AquaVENT VT'.
- **Development of healthcare products** – It is noted that:
  - Causeway Sensors is creating a point of care diagnosis prototype machine for sepsis;
  - Leckey is in the process of creating new disability products with sensors specific to patients for comfort, heat control and pressure points;
  - Armstrong Medical is developing patient care products to reduce the nursing time for equipment changes Armstrong is a specialist manufacturer of breathing and respiratory products have scaled up its capacity to manufacture disposable breathing circuits and electromedical devices for Intensive Care Units (ICUs) to meet global demand. Recently they launched a range of products including the AquaVENT VT breathing circuit which incorporates some of the research & development (R&D) generated from the NWCAM collaboration with Ulster University; and
  - axial3D is pioneering medical surgery technologies to speed up transplant surgery and improve success rates. Furthermore, they repurposed 3D printing capacity to print much-needed parts for ICU ventilators, as well as COVID-19 test kits and masks for the National Health Service (NHS) and the Health and Safety Executive (HSE)
- **Development of new materials** in a new sectoral area (e.g. Denroy). Denroy Plastics has been working with a consortium of local businesses to design and manufacture the Hero Shield, a plastic protective visor to guard the face

Furthermore, anecdotal feedback from the Project Partners suggests that the project has served to (at least in part):

- Increase businesses' knowledge and understanding of the benefits of working collaboratively with academic institutions which may result in the development of longer-term working relationships;
- Linked to the previous point, the Project Partners note that businesses have developed a greater understanding of the respective research strengths and capabilities that exists within the academic institutions; and
- Increase academia's understanding of the needs of industry.

4. RENEWABLE ENGINE

4.1 Introduction

This section of the report considers the Renewable Engine (RE) project, which was awarded grant funding under Priority Axis 1a – Enhancing Research and Innovation, Specific Objective 1.1 – Increasing business and industry-relevant research and innovation capacity across the region.

4.2 Project Overview

The Renewable Engine project intends to provide innovation support to businesses that typically lack physical facilities and equipment to carry out R&I activities to enable them to exploit new technology and sectors. Through this support, the project is seeking to position the region as a centre for the development of smart and innovative technologies through the development of a cross-border 'super-cluster' model, involving high calibre research and industry partners. Importantly, it is anticipated that this new collaboration will, for the first time, bring cross-border research centres together across the disciplines of advanced manufacturing and renewable energy and this will catalyse the change needed.

The Renewable Engine project partnership, which is led by South West College (SWC), is summarised below:

Table 4.1: The Renewable Engine project partnership

No.	Partner name	Abbreviation	Country
1.	South West College	SWC	Northern Ireland
2.	Queens University	QUB	Northern Ireland
3.	Institute of Technology Sligo	ITS	Ireland
4.	Advanced Forming Research Centre (University of Strathclyde)[69]	UoS	Scotland
5.	Manufacturing NI	MNI	Northern Ireland
6.	Action Renewables	AR	Northern Ireland
7.	Mid Ulster District Council	MUDC	Northern Ireland

Figure 4.1: The Renewable Engine Research Supercluster

[69] The Advanced Forming Research Centre (AFRC) is a globally recognised centre of excellence in innovative manufacturing technologies, R&D, and metal forming and forging research. This High-Value Manufacturing Catapult is a collaborative venture between the University of Strathclyde, Scottish Enterprise, UK Government and leading multinational engineering firms. The £80m facility has a world-leading reputation for research and focuses on using its production-scale facilities to take new R&D up the TRL scale and accelerate its industrial exploitation. The AFRC is one of only seven High-Value Manufacturing Catapult centres in the UK.

It is anticipated that the R&I supercluster will include 3 Principal Investigators (10% time), 4 full-time post-doctoral researchers, 12 PhD students and 3 R&I co-ordinators working with a minimum of 8 industry partners.

R&D activity within RE is being delivered through three cross-border research programmes focussed on three thematic areas:

1. Additive Manufacturing;
2. Renewable Energy Technologies; and
3. Intelligent Manufacturing Systems.

Project Partners state that the research programme will focus on 3 key research areas:

1. Energy generation;
2. Energy storage; and
3. Energy connectivity.

Six work packages have been established, with each of the partners responsible for the management of the delivery of a distinct work package.

Table 4.2: Overview of Renewable Engine Work Plans	
Work Plan	**WP Lead**
WP 1: Project Management	SWC
WP 2: Stakeholder Engagement	UoS
WP 3: Business and Industry Engagement	SWC
WP 4: Academic Research	QUB
WP 5: Quality of research outputs and the implementation of the renewable Engine R&I supercluster	ITS
WP 6: Communication Activities	SWC

Each project has been assigned at least 1 PhD student who is working on the project on a full-time basis with full academic support from the project partners. A minimum of 8 of the PhD researchers will be aligned directly to the industry projects plus 50% of each of the Post Doc researchers. The remainder (4 PhD researchers plus 50% Post Doc plus Principal Investigators) will be on research projects within the partner institutions.

The Project Partners have also allocated up to €350,000 to directly support innovation projects through an open call[70]. Successful applicants to the Open Innovation Call can attract funding towards their eligible project costs via an additional application round. The percentage of costs that the project partners will pay varies depending on the type of research being carried out and the size and type of organisation involved. The purpose of the grant funding is to assist the industry partner in developing their project proposal in a manner that supports the objectives of the Renewable Engine project. For example, this may include providing support to the associated PhD research project through the provision of technical assistance, demonstration equipment etc. To be in scope, a proposal must:

- Demonstrate transformational or disruptive, market-led innovation leading to novel, new products, processes or services or bring about a significant improvement in existing products, processes or services;
- Articulate a clear, anticipated growth and commercialisation impact for the business(es) with considerable, demonstrable potential to lead to a significant return on investment (ROI);
- Demonstrate how the grant funding will be used to support the company's submission under the Renewable Engine Open Call for projects;
- Demonstrate how the grant funding will be used to support or complement the work of the PhD research being undertaken as part of the Renewable Engine Open Call for projects.
- Priority will be given to proposals that are likely to lead to sustainable gains in productivity and/or access to new overseas markets through export-led business growth.

[70] A first round opened during 2018. Close to €200,000 was allocated within the first round of funding. In this first funding round, three businesses were successful in their applications to receive funding to support their research project proposals: Organic Power Ireland Ltd, Soltropy Ltd and Platinum Tanks. A second round opened on 1st July 2019.

4.3 Project Expenditure to December 2020

The Renewable Engine project received a Letter of Offer (dated 21st June 2017) offering a grant of up to a maximum of €5,802,426.20 (ERDF plus Government Match Funding) to be expended and claimed by 31st July 2021, towards total anticipated project costs of €6,104,994.82.

As of December 2020, the project had reported total estimated expenditure of €4,166,864, equivalent to 68% of the total project budget. The original projected spend for the same period estimated that 89% of the total project budget would be incurred at this time.

Table 4.3: Project Costs – Anticipated and Estimated Actual December 2020 (€)

Summary Budget	Anticipated Total	Actual to June 2019 Per Project Progress Report[71]	Reported to JS by FLC	Pipeline Expenditure (excluding items deemed ineligible by FLC)	Total Estimated Expenditure in December 2020[72]	% of total budget
Staff Costs	1,859,029	710,171	819,760	562,846	**1,382,606**	74%
Office and Administration Costs	1,067,603	338,501	404,945	371,564	**776,509**	73%
External Expertise and Services	2,484,211	649,846	764,271	715,739	**1,480,010**	60%
Travel and Accommodation Costs	135,571	55,685	68,824	15,165	**83,988**	62%
Equipment Costs	558,581	65,423	112,263	331,488	**443,751**	79%
Total	**6,104,995**	**1,819,626**	**2,170,063**	**1,996,802**	**4,166,864**	**68%**
Original projected spend level[73]					**5,460,382**	**89%**

[71] Source: Project Progress Report 10 – 'Total reported'. This was the most recently available collated project progress report.
[72] Source: SEUPB's EMS 14th December 2020
[73] Source: SEUPB's EMS 14th December 2020

4.4 Contribution to the Priority's Specific Objectives and Result Indicators

This section considers the Renewable Engine project's key achievements and the extent to which the Renewable Engine project has:

- Contributed to the achievement of the Priority's Specific Objectives; and
- Contributed to the achievement of the targets for the Result Indicators.

The section also identifies any external factors that have impacted, positively or negatively, on the project's ability to contribute to the achievement of the Specific Objective.

4.4.1 Key Achievements (to November 2020)

The Renewable Engine project partners report that the biggest impact of the COVID-19 pandemic has been upon its industry partners, noting that their ability to progress with their anticipated research & innovation activity is at risk due to broader economic concerns. Nonetheless, as of November 2020, the project had managed to retain each of its industry partners.

However, the restrictions have impacted on the ability to hold meetings and conferences that were anticipated to be used to disseminate information and knowledge transfer activities. Some underspend has emerged as a result.

The Renewable Engine project partners cite the project's key achievements (between April 2018 and June 2020) as being:[74]

Table 4.4: Examples of key achievements to date

Period	Dates	Key Achievements/Points of Note
6	1st April 2018 – 30th June 2018	• Major events in this period included participation at the Engage with Strathclyde, All-Energy, Ceed Scotland and European Energy Policy Forum events which each provided excellent exposure for the Renewable Engine project. • Other events that UoS were involved in included the Bryden Centre brokerage event and the Energy Technology Partnership emporium. • The final student positions accepted offers meaning each of the project teams was now established. • 4 collaboration agreements were signed with industry partners outlining the IP arrangements (Kastus, Kingspan, Organic Power and Platinum Tanks). • All three members of the research team at QUB produced technical papers and presented their findings at the ESAFORM 2018 Conference (Palermo, Italy). • The R&I Coordinator at IT Sligo participated in a stakeholder event organised by Mayo County Council who had been appointed as the lead authority in the Atlantic Seaboard North Region. • UoS continued to work on the sustainability strategy for the project as a means of maintaining the research super-cluster post-INTERREG funding.

[74] Please note that the key achievements have been documented in respect to the most recent Partner Project Progress reports that were available to the Evaluation Team at the time of writing. The most recently available collated Project Progress report for the project was for period 10 (April – June 2019).

Table 4.4: Examples of key achievements to date		
Period	**Dates**	**Key Achievements/Points of Note**
7	1st July 2018 – 30th September 2018	• The research projects were considered to be progressing well with the first project publications being developed. The first papers had been submitted for review by targeted peer-reviewed journals by ITS and SWC. • Industry Grant Award funding applications were assessed and preparations for the award were underway. • QUB recruited their 3rd PhD student meaning 11 positions had been filled, with only 1 remaining vacancy across the project. • Staff presented at several international conferences including one at Westminster. • A scoping exercise for potential future funding opportunities was conducted by the project partners. • Staff took part in some training and personal development activities. • New members were recruited to join the International Stakeholder Group (led by UoS); Andrew Stokes, International Business Development Manager, Energy Systems Catapult and John Bingham, Director, Energy Technology Centre.
8	1st October 2018 – 31st December 2018	• Renewable Engine actively participated in both the ETP and ERA conferences, in Glasgow and Nottingham, respectively. • Much planning took place concerning the sustainability of the research super-cluster post-funding. This involved investigation of non-EU funding streams and potential new partners, both in an academic and industrial sense. • The partners worked together to develop the Innovation Management & Exploitation Plan. • The first 2 companies received offers and 20% advances of their industry grant award funding. • The first journal publications were accepted, despite not being of a cross-border nature.
9	1st January 2019 – 31st March 2019	• Renewable Engine was presented at the Action Renewables Innovation Technology Event in Belfast and the National Sustainability Summit in Dublin and exhibited at the National Manufacturing Conference (co-located). • The project was presented at the Action Renewables Energy Efficiency event. The project staff and researchers took part in the Research Colloquium in Scotland. • Project staff presented the project at CMU Energy Week in Pittsburgh, USA.
10	1st April 2019 – 30th June 2019	• SWC delivered training to the industry partners in receipt of industry grant award funding from the Round 1 call. • SWC led the development of content for the project's website. • SWC developed documentation for the 2nd Round call for Industry Grant Award funding. • ITS researchers attended the ENVIRON 2019 conference & EUBCE Conference (Lisbon). • Project staff attended an Invest NI Energy Workshop held in Glasgow alongside the All Energy conference, at which Renewable Engine participated in the new Research Zone. Student posters and oral presentations disseminated the ongoing research activities to relevant stakeholders. • Project researchers attended the Bryden Centre summer school.

Table 4.4: Examples of key achievements to date		
Period	**Dates**	**Key Achievements/Points of Note**
11	1st July 2019 – 30th September 2019 (from partner progress reports)	SWC • The Project Manager attended a project management meeting with other PMs of Interreg projects in Belfast. • SWC also worked with the other partners to identify new funding opportunities to aid the sustainability of the research cluster long-term. SWC staff attended an Invest NI innovation event. IT Sligo • The PhD student worked in Prof. Tom Richards's research group at PSU and submitted a book chapter in "Green Chemistry for the Sustainable Development of Chemical Industry". • The Senior Researcher presented a research paper at GFMAT-2, July 21-26 in Toronto. He also submitted the revised manuscript on Indium doped TiO2 to the Journal of Physical Chemistry C. • Established working collaborations between IMR, Ireland and the RE project. Potential joint projects and how the RE outputs could be further exploited were discussed. QUB • The PDRA attended several events and training courses during the summer relating to the RE project. In early July, the PDRA attended and presented a keynote talk on 'The Next Generation of Rotational Moulding Machines' to a conference in Paris. UoS • A new student started in June and was working on the literature review for his research
12	1st October 2019 – 31st December 2019 (from partner progress reports)	SWC • Assessment, processing, and preparation of Round 2 Industry Grant Award offers. • Attendance at SEAFUEL conference, ETP Conference in Scotland, Engineering Employers Event at SWC. • Liaison with the Bryden Centre Project regarding the anticipated conference in February 2020. • The shooting of video across project partners. • Planning of an Energy Storage event in collaboration with Action Renewables Energy Association. • Renewable Engine Energy Storage Event at CREST in collaboration with Action Renewables Energy Association. • Attendance at NWCAM event at Catalyst. UoS • Period 12 saw two staff changes. First, a new R&I coordinator was recruited and took up her post on November 1, 2019. Also, the Knowledge Exchange Fellow resigned from his post in December 2019. • The students presented talks and posters at the Energy Technology Partnership conference in Dundee, UK. Staff attended both this and the Action Renewables Energy Storage event in Enniskillen, UK. QUB • The PDRA attended several events and training courses during the autumn relating to the RE project. In November, the PDRA attended two events organised by the British Plastics Federation. The BPF 'Plastics in Automotive' Conference 2019 held on the 5th November in Birmingham and the Recycling Seminar on the 7th November in London. The PDRA also assisted in the preparation of the 3 conference papers that were submitted to ESAFORM 2020 to be held in Germany in April. IT Sligo • The PhD student attended the IRBEA On-Farm Small Scale Biogas Workshop (10/10/2019) and their book chapter "Production of Biodiesel Using Ionic Liquids" was accepted for publication.

Table 4.4: Examples of key achievements to date		
Period	**Dates**	**Key Achievements/Points of Note**
13	1st January 2020 – 31st March 2020 (from partner progress reports)	SWC • SWC represented Renewable Engine at the CASE conference in January (QUB). • SWC participated in a Renewable Engine future funding workshop with other partners. SWC met with Associate partners Mid Ulster Council and Manufacturing NI on behalf of the Renewable Engine partnership. UoS • Recruitment for a new postdoctoral researcher commenced in January 2020, who then and started the post in March 2020. QUB • During this period, the members of the Renewable Engine research team were invited to present their findings at a large international conference dealing with rotational moulding (STAR 2020) in Goa, India. They also attended Plastivision 2020 in Mumbai, one of the largest plastics exhibitions in the world. Manufacturing NI • Manufacturing NI delivered a Renewable Engine workshop at the Lough Erne Resort as part of the nationwide "Manufacturing Month"; showcasing the project to attendees from across the manufacturing sector. AR • Action Renewables delivered a Renewable Engine Energy Storage event to stakeholders within the Action Renewables Energy Association (AREA) and beyond. This successfully disseminated ongoing project activity highlighting the support to SMEs provided by the partnership.
14	1st April 2020 – 30th June 2020 (partner progress reports)	SWC • Period 14 saw all project staff and researchers work remotely as the COVID-19 lockdown restrictions were imposed across the INTERREG region. • SWC led a concentrated effort to sustain the project cluster with a bid for future funding through the Erasmus+ programme. This was a direct output of the International Stakeholder Group meeting earlier in the year. • The Project Manager completed training - Level 7 Certificate in Strategic Management & Leadership. UoS • The Principal of UoS designated Fridays of every week as ‘rest days’ during the lockdown. Although not mandatory, the project staff were encouraged to take these. Any rest days taken by Renewable Engine students and staff was indicated on the timesheets. These were anticipated to conclude on August 07, 2020. IT Sligo • A PhD student co-authored a submitted paper “COVID-19: Rapid prototyping and production of face shields for infection control”. • The research coordinator had separate meetings with the industry project representatives in Organic Power Ltd and Kastus Ltd to discuss the project and the industry research continuity during the COVID pandemic period.

4.4.2 *Progress towards the Project's Output Indictors*

Table 4.5 provides a high-level summary of the progress that has been made by the Renewable Engine project towards its Output Indicators.

Table 4.5: Progress towards the RE Output Targets

Output Code	Description	Programme Output Indicator Target	Renewable Engine Project Target	Progress as of September 2020[75]	Variance against project target	Commentary
CO01	No. of enterprises receiving support	20	8	8	-	Proceeding according to the work plan. As noted, support continues to be provided to the following businesses: Kingspan Water and Energy, Platinum Tanks, Rotosim Ltd., Organic Power Ireland Ltd., Kastus Technologies, Caley Ocean Systems, B9 Energy Storage Ltd, Soltropy Ltd., Doosan Babcock, Booth Welsh Automation.
CO02	No. of enterprises receiving grants	20	4	4	-	Proceeding according to the work plan.
CO04	No. of enterprises receiving non-financial support	20	8	8	-	Proceeding according to the work plan.
CO24	Years of PhD (or above) level research	514	57.05	43.14	76%	Proceeding according to the work plan.
CO26	No. of enterprises cooperating with research institutions	10	8	8	-	Proceeding according to the work plan.
CO41	No. of enterprises participating in cross-border, transnational or interregional research projects	10	8	8	-	Proceeding according to the work plan.
CO42	No. of research institutions participating in cross-border, transnational or interregional research projects	5	4	4	-	Proceeding according to the work plan. Research Institutions engaged on the RE project include SWC, QUB, ITS and the University of Strathclyde.

4.4.3 *Target Groups Reached*

Table 4.6 (overleaf) provides an overview of the target groups reached as a result of the Project's activity to date.

[75] Source: SEUPB's quarterly monitoring data.

Table 4.6: Target groups reached as a result of the RE project activity[76]					
Target Groups	**Target Value**	**Target Groups Reached (as of June 2020)**	**Target Groups Reached June 2020 %**	**Description of Target Group inv.**	**Source of Verification**
Higher education and research	15	32	213%	• 4 research organisations participating in cross-border R&I; • 3 Research Colloquium to promote knowledge transfer; • Dissemination of 10 peer-reviewed academic journals; • 4 RE flagship events.	Examples cited include: • Ulster University was in attendance at the launch event along with the Centre for Advanced Sustainable Energy. • The University of Liverpool was also involved in a strategy development workshop held at SWC CREST. • An Assistant Professor from Dublin City University joined the ISG and took part in the first meeting. • The project was showcased to several Irish and Scottish academic representatives at the Environ conference in Cork, including; NUIG, DIT, TCD, UCC, CIT, DKIT, IT Carlow, UL, Glasgow Caledonian University and the University of Isles and Highlands. This was achieved through both oral and poster presentations by project staff and students.
SME	50	55	110%	• 8 enterprises participating in the R&I supercluster; • 4 enterprises receiving technology development grants • 4 RE flagship events to promote the dissemination of knowledge within the SME network; • Industry briefing events.	Examples cited include: • Platinum Tanks, B9 Energy, CD Enviro, Doosan Babcock, Booth Welsh, Kingspan, Bioil, Dimplex Renewables all attended the launch event. • Maus GmbH took part in the first ISG meeting. • SWC engaged with the Camlin Group at the Invest NI event in Glasgow. • SWC also engaged with DHD who are developing AR technology for wind turbine maintenance in collaboration with Digital Catapult NI. • SWC engaged with KPMG & Glen Dimplex at Manufacturing NI event.
Business support organisations	15	16	107%	Business Support Organisations will be targeted through: • Participation in the project board (Invest NI, Scottish Enterprise, Highlands and Islands Enterprise, Enterprise Ireland, Economic Development Directorate Scotland); • 4 RE flagship events.	Examples cited include: • Invest NI, IDA Ireland attended the launch event. • In addition to this, the European Institute for Innovation, Scottish Enterprise, and the Ireland Institute of Pittsburgh were part of the ISG and took part in the first meeting. • SWC met and presented its research to Digital Catapult NI who are developing AR technology for wind turbine maintenance alongside DHD. • SWC engaged with Helix Innovation & Centre for Competitiveness at Manufacturing NI event.
Regional public authority	8	9	113%	The regional public authority will be targeted through: • Direct involvement in the project as an associate partner (Mid-Ulster Council); • Participation in the Project Board (DfE, DJEI); • 4 RE flagship events	Examples cited include: • Mid Ulster Council attended the launch event along with DfE and the Executive Office. • Cork County Council were reached through the Environ event, at which they were involved and in attendance. • SWC engaged with North/South Ministerial Council at Peace Plus consultation.
Sectoral agencies	5	10	200%	Sectoral agencies will be targeted through: • Direct involvement as associate partners (Manufacturing NI, Action Renewables); • Participation in the international stakeholder group	Examples cited include: • Manufacturing NI, Action Renewables, Meath Energy Agency attended the launch event; • The Environmental Protection Agency (Ireland) and the Environmental Science Association of Ireland were both engaged with Renewable Engine projects at the Environ conference held in Cork.

[76] Source: SWC individual Partner Report (1st April 2020 – 30th June 2020)

4.4.4 Progress towards the Project's Result Indicator Targets

Per Table 4.7, it is anticipated that the Renewable Engine Project would contribute 10 peer-reviewed journal and conference publications with cross-border authorship.

Table 4.7: Progress towards the RE Results Indicator

Name of Output	Programme Target	Renewable Engine Project Target	At August 2020[77]
No. of peer-reviewed journal and conference publications with cross-border authorship	75	Minimum of 10	6

As of August 2020, the project has finalised 6 peer-reviewed journal and conference publications with cross-border authorship.

4.5 Impact of COVID-19

As reflected in Section 2, key findings related to the impact of COVID-19 or otherwise on the Renewable Engine project include the following:

- Despite the progress made (see Section 4.4), the restrictions associated with the COVID-19 meant that:
  - Project staff across the project partners and also the project beneficiaries were encouraged to work remotely, whilst others (within the industry partners) were furloughed or made redundant;
  - Some PhD experimentation work was postponed, meaning that the data required for PhD projects have not yet been collected. However, many of the PhD researchers have been able to continue writing activities (thesis & journal papers) while working remotely.
  - Several of the PhD students became involved in manufacturing PPE;
  - However, the project partnership has some concern about the impact of the lockdown periods and restrictions on travel on the mental wellbeing of researchers, particularly concerning students who moved to the UK/Ireland to participate in a Renewable Engine project and may feel very isolated with the current situation (lack of friends/family in the country etc.). Consequently, the partnership has endeavoured to increase its contact through remote means with the PhD researchers;
  - Whilst most of the planned activities will take place, some may not, due to planned dissemination activities potentially being delayed into 2021 if conferences and other events are postponed.
  - Expenditure levels have slowed due to reduced travel, the postponement of conferences and events and by the decision to not proceed with some experimental research work during the lockdown period.

- However, discussion with the Renewable Engine project partnership indicates that:
  - At the end of the first lockdown period, PhD students and researchers began to return to laboratories to complete any outstanding experimentation work. The partnership considers that the project's research activity should be completed within the original timeframe but have concerns over the dissemination of the findings and outputs to industry/stakeholders as the time for this activity will be restricted.
  - Nonetheless, they continue to consider that the project is on track with little risk to it fully achieving its aims and objectives;
  - The partnership is closely monitoring the industry technology development projects but may be required to run a third round of the funding competition to allocate money that will no longer be utilised due to operational changes as a result of COVID-19.
  - It is feasible to make up for delays caused by the pandemic;

[77] Source: Consultation with project lead (21/08/2020).

- The partnership considers that they will be able to deliver the project fully within their current budget, albeit noting that an extension to the project timeframe would be beneficial;
- There is a risk to the project insofar as the economic downturn may mean that some industry partners do not survive.

- The Evaluation Team notes that discussion (during December 2020) with SEUPB's Joint Secretariat indicates that it is working closely with each of the Priority Axis 1 projects to establish the impact of the pandemic on their project and their potential requirements (e.g. project extensions). SEUPB's anticipates that it will receive formal feedback on these matters from each of the projects during early 2021.

4.6 Impact on Business and Industry

This section considers the impact of the Renewable Engine project on business and industry within the eligible region.

As might be expected given the interim nature of the project's implementation and the continued focus in carrying out the research aspects of the project, the tangible impact of the project on business and industry (in terms of generating outputs and outcomes) can only be measured in the longer term and will be a core focus of the Evaluation Team's next tranche of research.

Notwithstanding this, anecdotal feedback from the Project Partners suggests that the project has served to (at least in part):

- Identify wider research and business development opportunities. For example, it was noted that, as a result of their interaction on the project, several Scottish businesses are currently exploring the potential to use locations on the Island of Ireland as potential test centres.
- Increase businesses' knowledge and understanding of the benefits of working collaboratively with academic institutions which may result in the development of longer-term working relationships;
- Linked to the previous point, the Project Partners note that businesses have developed a greater understanding of the respective research strengths and capabilities that exists within the academic institutions;
- Increase academia's understanding of the needs of industry; and
- Support businesses to take forward commercially focused R&D which may not have been undertaken due to their capacity and capability.

5. BRYDEN CENTRE FOR ADVANCED MARINE AND BIO-ENERGY RESEARCH

5.1 Introduction

This section of the report considers the Bryden Centre for Advanced Marine and Bio-Energy Research (Bryden) project, which was awarded grant funding under Priority Axis 1a – Enhancing Research and Innovation, Specific Objective 1.1 – Increasing business and industry-relevant research and innovation capacity across the region.

5.2 Project Overview

The Bryden project has seven project partners including Queen's University Belfast (as Lead Partner), University of Highlands and Islands, Letterkenny Institute of Technology, Ulster University, Agri-Food and Biosciences Institute, Donegal County Council and Dumfries and Galloway Council[78]. Before the introduction of the project, the project partners had been working together for 4-5 years on an innovation centre concept that aimed to address market failures in the eligible region. The project partners suggest that their partnership has been helped by an alignment of cultures and competencies and a desire to build on the expertise amongst the project partners to create a lasting legacy for the renewables sector, and cross-border academic/industry collaborations.

The project partners anticipate that Bryden will create a 'virtual competence centre' that will support industry-led applied/pre-commercial collaborative research (at Technology Readiness Levels - TRLs 2-6) on a cross-border, interregional basis that is focused on two specific forms of renewable energy, which are considered to have the greatest sustainable potential and widest applicability in the region:

1. Marine renewable energy; and
2. Bioenergy.

The project aims to build upon and considerably enhance existing research activity and capability in the region, and in particular that which is undertaken at the CASE Competence Centre, by facilitating a scale of activity and a critical mass of expertise and knowledge transfer within the region that has not been possible to date, but which is anticipated to generate impact and added value on a comparable basis.

Using a Doctoral Training Centre model, it is anticipated that the Bryden project will recruit 34 PhD students and 5 PDRAs; each of whom will work with industry to produce industrially relevant research with the potential for commercial exploitation and resulting economic growth within the region.

Bryden aims to provide a supportive interdisciplinary environment for students to carry out a challenging PhD-level project. It will provide engineers and scientists with the skills, knowledge and confidence to tackle the evolving issues and future challenges of the renewable energy sectors. It will act as a catalyst for bringing industry and academics together on a cross-border basis, create new working cultures, build relationships across universities and forge lasting links with industry.

Bryden's Vision is to *"provide the springboard to the growth of world leaders in the marine and bio-energy sectors in the region'. By bringing together industrial and academic partners, BRYDEN will deliver a step-change in the level of industry-informed research and innovation that the sector can capitalise on, and supply of doctoral-level scientists and engineers to enable sustained growth for years to come".*

[78] It is anticipated that Dumfries and Galloway County Council and Donegal County Council will provide a conduit to connect Bryden to business enterprises and will support networking and dissemination of the project within their regions. This support will be provided as part of each County Council's delivery strategy as an in-kind contribution to the project and will not be remunerated.

It is envisaged that businesses will benefit by gaining a deep knowledge of new technology or science, having time to assess it before (potentially) investing in its commercialisation. Knowledge and skills transfer will also occur as all 34 PhD students will work closely with industry.

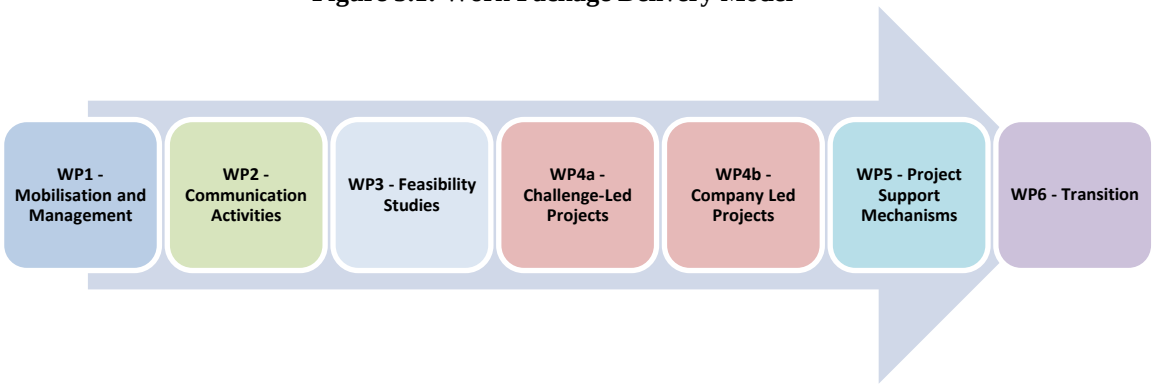
Each PhD student will be co-supervised on a cross-border basis.

Whilst the specific scope of the research projects will not be known until they apply and are assessed as part of the suggested model, it is envisaged that the research undertaken might focus on areas such as:

- Ensuring that renewables can compete successfully, without subsidy, once external environmental costs and other contributions to social goals (e.g. access, security) are taken into account.
- Improved performance (and cost reductions), including conversion efficiency, reliability, durability and lifetime - helping to reinforce the role of renewable energy in a sustainable energy system.
- Advanced manufacturing techniques for components;
- Reduced material requirements, especially for toxic materials;
- Sustainable production processes that minimise life-cycle environmental impacts through manufacturing, use, recycling and final disposal;
- Improved methods for integrating renewable energy into buildings, electricity grids and other distribution systems.
- Developing ICT protocols that enable and optimise renewable energy availability and its integration into transmission/distribution infrastructure at the community, regional, national and transboundary levels;
- Socio-economic research aimed at developing effective policy measures that will encourage the deployment of renewables and enhance public acceptability of new energy technologies.

The Bryden project employs the following distinct and inter-related 'work package' delivery model, which was developed following the project planning phase and consultation with all partners who have informed its design:

Figure 5.1: Work Package Delivery Model



The Bryden project's Letter of Offer identifies the project's objectives as being to achieve the following:

- A platform to enable cross-jurisdictional academic and industry collaboration.
- Significantly increase the level of business and industry-relevant research and innovation in the marine renewable energy and bio-derived energy sectors in the region to enhance industry competitiveness in a global marketplace.
- Bridge the gap between scientific and commercial innovation at TRLs 2-6, providing a pathway to commercialisation.
- Provide a critical mass of researchers and pool cross-disciplinary industrial and academic knowledge and complementary capabilities and facilitate knowledge exchange across jurisdictional boundaries.
- Create new knowledge to foster competences in the deployment and development of renewable energy technologies.

5.3 Project Expenditure to December 2020

The Bryden project received a Letter of Offer (dated 17th July 2017) offering a grant of up to a maximum of €9,367,401.45 (ERDF + Government Match Funding) to be expended and claimed by 31st December 2021, towards total anticipated project costs of €9,752,679.76.

In May 2020, the SEUPB approved the reallocation of budget between categories, as shown in Table 5.1. As of December 2020, the project had reported total estimated expenditure of €5,166,408, equivalent to 53% of the total project budget. The original projected spend for the same period estimated that 77% of the total project budget would be incurred at this time.

Table 5.1: Project Costs – Anticipated and Estimated Actual December 2020 (€)

Summary Budget	Anticipated Total	Actual to November 2019 Per Project Progress Report[79]	Reported to JS by FLC	Pipeline Expenditure (excluding items deemed ineligible by FLC)	Total Estimated Expenditure at December 2020[80]	% of total budget
Staff Costs	2,791,419	809,899	969,408	373,751	**1,343,159**	48%
Office and Administration Costs	1,869,518	647,944	771,018	246,591	**1,017,608**	54%
External Expertise and Services	4,605,223	1,581,088	1,872,058	604,151	**2,476,209**	54%
Travel and Accommodation Costs	138,689	36,908	43,531	4,605	**48,136**	35%
Equipment Costs	347,830	211,553	262,189	19,107	**281,296**	81%
Total	**9,752,680**	**3,287,392**	**3,918,204**	**1,248,205**	**5,166,408**	**53%**
Original projected spend level[81]					**7,466,789**	**77%**

[79] Source: Project Progress Report 10 – 'Total reported'. This was the most recently available collated project progress report.
[80] Source: SEUPB's EMS 14th December 2020
[81] Source: SEUPB's EMS 14th December 2020

5.4 Contribution to the Priority's Specific Objectives and Result Indicators

This section considers the Bryden Centre's key achievements and the extent to which the Bryden Centre has:

- Contributed to the achievement of the Priority's Specific Objectives; and
- Contributed to the achievement of the targets for the Result Indicators.

The section also identifies any external factors that have impacted, positively or negatively, on the project's ability to contribute to the achievement of the Specific Objective.

5.4.1 Key Achievements (to May 2020[82])

The Bryden Centre project partners cite the project's key achievements (between March 2019 and May 2020) as being:

Table 5.2: Key Achievements

Period	Dates	Key Achievements/Points of Note
8	1st March 2019 - 31st May 2019	• The Bryden Centre Operations Manager and Administrative Assistant/Media Specialist were appointed and contributed towards ensuring that the work of the Bryden Centre was focussed on the delivery of outputs. The dissemination and exploitation strategy were re-evaluated to ensure communication activity was more focussed and purposeful. • The Bryden Centre was presented at several events, namely the All Energy conference in Glasgow and Balmoral Show in Belfast. • With 4 PDRA positions filled there was a renewed focus on developing feasibility studies, some of which were in the pipeline as PDRAs entered discussions with interested parties. • Preparations were underway for the second Bryden Centre Summer School in Inverness in June 2019.
9	1st June 2019 – 31st August 2019	• The Bryden Centre started to implement the new dissemination and exploitation plan with enhanced targeting of key stakeholder groups and a more active social media profile. • A modification was submitted to SEUPB after the Bryden Centre Board considered the options as to the best way forward for the project. • Progress with PhD projects was considered to be good except for one QUB student who withdrew. • The Summer school was hosted by UHI and was held in Oban and Inverness. • The Bryden Centre launched a new conference - Engineering the Energy Transition. This was anticipated to be held in the Titanic Hotel in Belfast and was aimed at attracting a wide range of senior-level delegates from the UK, Ireland and overseas. • Several students and PDRAs attended conferences both at home and abroad and showcased the work of Bryden via talks, posters, and presentations.
10	1st September 2019 – 30th November 2019	• During this period the project focused and invested in developing its social media platform, analysing Industry partners and stakeholders and the social media platforms they used to exploit those platforms with targeted messages regarding the research, global trends or industry developments depending on the audience that particular platform had. This resulted in increased engagement from stakeholders via social media and increased the project's reach.

[82] Please note that the key achievements have been documented in respect to the most recent Partner Project Progress reports that were available to the Evaluation Team at the time of writing. The most recently available collated Project Progress report for the project was for period 10 (September – November 2019).

Table 5.2: Key Achievements		
Period	**Dates**	**Key Achievements/Points of Note**
11	1st December 2019 – 28th February 2020 (from partner progress reports)	• 3 new PDRAs joined the Bryden Centre team. • A second modification request was submitted to SEUPB to request minor budget modifications which were anticipated would enable the recruitment of further PDRA support. • Communications - The first Bryden Centre Engineering the Energy Transitions Conference was held in Belfast in February. The advertising for this conference helped to improve the project's reach on social media.
12	1st March 2020 – 30th May 2020 (from partner progress reports)	<u>QUB</u> • The main issue in this quarter was dealing with the impact of the University sites being closed due to the Covid-19 pandemic and how best to deal with the resulting issues. The main impacts were on research projects and dissemination activities. Most students were able to use the enforced desk time to focus on writing papers and journals and writing up results. However, some student research activities were seriously impacted by their inability to carry out fieldwork. • The Summer School moved online after the week of activities in Letterkenny had to be cancelled. The feedback received from the virtual summer school was positive. <u>UHI</u> • UHI delivered the Environmental Interactions of Marine Renewables (EIMR) 2020 conference online. The conference was supported by The Bryden Centre, with 9 UHI Bryden Centre project presentations delivered from across the consortium partners • UHI contributed 3 UHI project presentations to the 6th World Seabird Twitter Conference • A second Post-doc joined the UHI Bryden Centre team on 1st April 2020. <u>LYIT</u> • In addition to supporting a student in mapping and video editing, the Research Assistant/Technician was actively engaged in consultations with the Department of Housing and Local Government on the proposed National Marine Planning Framework.

5.4.2 *Progress towards the Project's Output Indicators*

Table 5.3 provides a high-level summary of the progress that has been made by the Bryden Centre project towards its Output Indicators.

Table 5.3: Progress towards the Output Targets

Output Code	Description	Programme Target	Bryden Centre Target	Progress as of Feb 2020[83]	Variance against target	Commentary
CO01	No. of enterprises receiving support	20	30	64	213%	Proceeding according to Work Plan. Achieved and ongoing.
CO02	No. of enterprises receiving grants	10	8	0	0%	Not Started. It is anticipated that this aspect of the project will be taken forward during the last year of the project.
CO04	No. of enterprises receiving non-financial support	20	30	64	213%	Proceeding according to Work Plan. Achieved and ongoing.
CO24	No. of new researchers in supported entities	T1.1.1	127.5	52.04	41%	Proceeding behind schedule due to delays in the recruitment of PhD students and PDRAs.
		T2.1.1	3.0	0.76	25%	
		T4.2.1	2.0	0.0	0%	
		514	**132.5**	**52.8**	**85%**	
CO26	No. of enterprises cooperating with research institutions	10	30	64	213%	Proceeding according to Work Plan
CO41	No. of enterprises participating in cross-border, transnational or interregional research projects	10	30	64	213%	Proceeding according to Work Plan
CO42	No. of research institutions participating in cross-border, transnational or interregional research projects	5	5	10	200%	Achieved and ongoing.

In summary, the Bryden Centre project is progressing towards its project work plan and is on progress to achieve each of its respective output indictors, albeit the Lead Partner notes that their ultimate achievement will likely require an extension to the timeframes stipulated within its LoO.

[83] Source: SEUPB's quarterly monitoring data.

5.4.3 Target Groups Reached

Table 5.4 provides an overview of the target groups researched as a result of the Project's activity to date.

Table 5.4: Target Groups Reached

Target Groups	Target Value	Target Groups Reached (at Feb 2020[84])	Examples include:	Target Groups Reached so far %
Higher education and research	5	13	Renewable Engine (the University of Strathclyde, Sligo Institute of Technology, South West College), SPIRE, ETP, ERA and GEN Comm research programmes through the Academic Innovation Zone initiative. Also, Dundalk Institute of Technology and the potential for collaboration around tidal energy, focusing on hydrodynamic performance predictions and acoustic modelling.	260%
Enterprise, excluding SME	5	23	Encirc NI, Horiba Mira, Johnston Matthey, Siemens GAMESA, Trelleborg, Rolls-Royce, Host-Bioenergy, Findhorn Foundation, Scottish and Southern Electricity Networks, The Crown Estate Scotland, Cromarty Lighthouse station	460%
SME	25	56	AgriAD, G-100-EPOWER, Premier Green Energy, Sonas Energy, Solar Marine Energy, Nova Innovations, Global Marine; GlenWyvis Distillery; AWS Ocean Energy; Laminaria; Sustainable Marine Energy; Sonas Energy;	224%
Business Support Organisations	2	44	Marine Scotland Science, Wave Energy Scotland,	2,200%

[84] Source: Project Progress Report 11. This collated project progress report was still in progress at the time of writing (October 2020).

5.4.4 Progress towards the Project's Result Indicator Targets

Per Table 5.5 it is anticipated that the Bryden Centre Project would contribute 68 peer-reviewed journal and conference publications with cross-border authorship.

Table 5.5: Progress towards the Results Indicator

Result Indicator	Programme Target	Bryden Centre Project Target	Progress as of Feb 2020[85]
No. of peer-reviewed journal and conference publications with cross border authorship	75	68	2

As of February 2020, two peer-reviewed journal and conference publications with cross border authorship had been produced. However, the project partners note that a number are in development and anticipate that this element of the project's activity will ramp up as the research progresses. The project partners also note that they have developed 6 single jurisdiction publications to date.

5.5 Impact of COVID-19

As reflected in Section 2, key findings related to the impact of COVID-19 or otherwise on the Bryden Centre project include the following:

- Despite the progress made (see Section 5.4), the restrictions associated with the COVID-19 meant that:
  - Various staff across the lead partner's organisation, project partners or direct beneficiaries started working remotely, whilst some of the industry partners' staff were furloughed or made redundant.
  - Some of the industry partners have become more conservative about taking things forward. Whilst the project partners had planned visits to the industry partners to see the pandemic had impacted the business, these visits had to be cancelled due to lockdowns and associated travel restrictions.
  - However, the project considers it fortunate that much of the project can be delivered while not in the workplace. All of the studentships are continuing, those that are modelling based are unaffected by the lockdown but practical work in labs or the field was not being carried out during the period of lockdown. Nonetheless, all of the affected students had results to analyse, papers and theses to write, training, writing software, experimental design etc, with the project partners confident that they each had enough to occupy them for a minimum of three months. A similar situation existed for the PDRAs. In summary, desk-based work was brought forward to replace lab/field/conference activity. According to the project partnership, all the desk-based work was in the schedule but would have been delivered over a longer period.
  - Most outreach activities including conferences and student secondments were postponed. However, the second planned 2020 Bryden conference (Environmental Impact of Marine Renewables) was held virtually rather than a physical meeting. Other outreach such as social media articles did however continue.
  - The partnership suggests that the only non-planned activity is the extra management involved in overseeing students and mitigating the impact of the lockdown.
  - Expenditure has been lower than anticipated, largely due to reductions in travel and consumables.

[85] Source: Project Progress Report 11. This collated project progress report was still in progress at the time of writing (October 2020).

- However, discussion with the Bryden Centre project partnership indicates that:

  - The project is behind schedule and there is a risk that it will not achieve its aims and objectives;
  - Whilst most of the planned activities should be delivered, some may not without a six-month extension (which it is understood has been requested).
  - A second lockdown period poses a further risk that not all of the PhD students will have time to finish resulting in the target of 34 PhDs not being met. Furthermore, the number of research years may decrease (as the project will likely not be able to recruit another student at this stage).
  - The project can be delivered fully within its current budget;

- The Evaluation Team notes that discussion (during December 2020) with SEUPB's Joint Secretariat indicates that it is working closely with each of the Priority Axis 1 projects to establish the impact of the pandemic on their project and their potential requirements (e.g. project extensions). SEUPB's anticipates that it will receive formal feedback on these matters from each of the projects during early 2021. The Joint Secretariat's discussions with the Bryden Centre project partnership indicates that:

  - The project will likely require a 3 to 6-month project extension, but they will not be in a position to know exactly until the PhD students, in particular, can go back into the field and laboratories.
  - A key concern is for students in their final year of their PhD (and potentially a couple of others who are dependent on summer fieldwork) who may need extensions to complete due to the time they have lost for taking observations/making experiments.
  - There are other lower importance risks such as the ability of students to complete secondments but at this stage the risk is low.

5.6 Impact on Business and Industry

This section considers the impact of the Bryden Centre project on business and industry within the eligible region.

As might be expected given the interim nature of the project's implementation and the continued focus in carrying out the research aspects of the project, the tangible impact of the project on business and industry (in terms of generating outputs and outcomes) can only be measured in the longer term and will be a core focus of the Evaluation Team's next tranche of research.

Notwithstanding this, anecdotal feedback from the Project Partners suggests that the project has served to (at least in part):

- Stimulate significant additional investment by a project industry partner (Agri AD);
- Develop the skills and knowledge of PhD students, many of whom will ultimately work in industry in the future. It was further noted that the planned project secondments will facilitate the transfer of knowledge between academia and industry;
- Increase businesses' knowledge and understanding of the benefits of working collaboratively with academic institutions which may result in the development of longer-term working relationships;
- Linked to the previous point, the Project Partners note that businesses have developed a greater understanding of the respective research strengths and capabilities that exists within the academic institutions; and
- Increase academia's understanding of the needs of industry.

However, it is noted that the lead Project Partner also noted that the INTERREG VA Programme's requirement for support to be channelled to fund PhD studentships may inadvertently hinder longer-term economic development in the eligible region as a number of the PhD students that have been recruited have been outside the eligible region and may return to their country of residence resulting in a loss of knowledge and skillsets.

6. SPIRE 2 - STORAGE PLATFORM FOR INTEGRATION OF RENEWABLE ENERGY

6.1 Introduction

This section of the report considers the SPIRE 2 project, which was awarded grant funding under Priority Axis 1 – Enhancing Research and Innovation, Specific Objective 1.1 – Increasing business and industry-relevant research and innovation capacity across the region.

6.2 Project Overview

The SPIRE 2 project is a follow on from the SPIRE 1 project. The SPIRE 1 (Storage Platform for the Integration of Renewable Energy, 2013-2015) was a £2.9m research programme that aimed to establish the likely future value of energy storage as a variability management mechanism for the all-Ireland Single Electricity Market. This was achieved through a scenario and market modelling and aspects of research and demonstration to illustrate the storage technologies best suited to meeting market needs at the small (domestic), medium (distributed) and large (utility) scale.

The project partners acknowledge that while the expansion of centralised, grid-scale storage in the INTERREG region is already underway following the success of the SPIRE 1 project, there has been little progress in the wide-scale deployment of mass-energy storage (MES) which the SPIRE 2 project is based upon.

Variable renewable energy (VRE) resources (e.g. wind and wave) cannot be controlled and require measures such as energy storage to integrate them into existing power grids. Energy can be stored in bulk using large-scale storage, or at smaller scales using MES devices, owned and operated by domestic and business consumers. MES is crucial to achieving a global transition to clean energy. It allows for optimal use of existing infrastructure, has a less burdensome planning process than large-scale storage, and can be installed rapidly. While progress has been made with large-scale storage, there has been limited development of MES.

SPIRE 2, therefore, aims *"to evaluate, develop and facilitate the wide-scale deployment of MES/Distributed energy storage technologies to operate profitably in new market structures of UK, Northern Ireland and Ireland".*

It will consider how the wide-scale deployment of MES can allow very high levels of renewable energy to be integrated into power grids globally. It will also assess how MES can be used to maximise the whole-life performance of VRE systems operating in harsh environments.

Complementing the success of SPIRE 1 in establishing the case for grid-scale energy storage, it is anticipated that the SPIRE 2 project will:

- Focus in more detail on the opportunities for storage at the distributed electricity network, industrial, community and domestic consumer level, in the context of new market arrangements;
- Consider opportunities for improving the business models for such technologies through transparent visualisation of new market structures (i-SEM, DS3[86], CfD, Balancing Agreements, etc.).
- Seek to identify new market opportunities and complementary solutions at smaller scales, recognising their advantages in terms of ease of deployment, financing and a faster and less cumbersome planning process;
- Consider grid-scale technologies and electricity network constraints, including the proposed Compressed Air Energy Storage development and the potential for further interconnection at the modelling stage to determine the market capacity for SPIRE 2 products. Thus, an intense market

[86] DS3 (Delivering a Secure, Sustainable Electricity System) is expected to develop a suite of measures to address the challenges of integrating renewable generation onto the power system in a secure manner that can achieve the 2020 renewable energy target. The DS3 programme will help to define a route to market for those projects and will remunerate providers for the services of most value to the grid.

modelling package will address likely market segment sizes, necessary operational characteristics for optimal market participation and cost/benefit constraints.

It is envisaged that the SPIRE 2 will identify a viable pathway for the deployment of optimised energy storage solutions that benefit not only energy utilities, industrial complexes, communities and homes but also electricity transmission operators and distribution system operators and government's attempts to reach sustainability targets.

SPIRE 2 also aims to increase the region's Research and Innovation (R&I) capacity by creating a cross-border Virtual Research Graduate School (VRGS) in the area of Mass Energy Storage (MES). It is anticipated that the project will boost collaboration between Research Institutes and SMEs and intensify technological innovation and commercialisation in the region.

The project intends to recruit and graduate 17 PhD candidates, further develop 6 post-doctoral researchers, and enhance the standing of the academic and industrial teams. The suggested PhD topics are aligned to stakeholder needs.

Ulster University and Dundalk Institute of Technology were the partners in the SPIRE 1 project. SPIRE 2 has further expanded on this partnership with 2 additional universities as well as 14 additional partners. The project is led by Ulster University (UU), which specialises in research project management, electricity market modelling, thermal energy storage and demand-side management. The project's other academic partners include:

Table 6.1: SPIRE 2 Project Partners

No.	Partner name	Abbreviation	Country	Role
Lead	Ulster University	UU	UK/NI	
1.	Queens University Belfast	QUB	UK/NI	Leading on electricity storage and power networks
2.	Strathclyde University	STRATH	UK/Scotland	Leading on the life-cycle assessment of renewable energy in maritime climates
3.	Dundalk Institute of Technology	DkIT	Ireland	Leading on energy storage deployment when associated with variable renewable energy.

The project is also anticipated to involve several private sector businesses (including two who are formal project partners (Arbarr Electronics Ltd and Sunamp Ltd). The project partners consider that the benefit of having non-funded partners on the project is that the outputs and impact of the project will be shared across the full supply chain associated with Mass Energy Storage, across three jurisdictions and two energy markets (Single Electricity Market for Ireland and Northern Ireland and British Electricity Trading Transmission Arrangements (BETTA) and its subsequent Capacity Market, Contracts for Difference and Balancing Arrangements).

They further state that the project also needs to consider further interconnection with European markets. To that end, Electricity and Thermal Energy Storage technologies will be assessed for domestic, commercial, community and industrial applications in current and emerging electricity market structures in order for investment in renewable energy to benefit the region by use of the variable renewable energy when required.

To maximise the dissemination of the benefits of the project, it is structured as follows:

- Electricity generators and retailers (AES (NI), Energia (NI/Ire), SSE (NI, Ire, Scot), ESB (Ire)) supported by QUB, Ulster and Strathclyde;
- Technology companies (B9 (NI), Arbarr (NI), Glen Dimplex (NI), Sunamp (Scot), Climote (Ire)) supported by QUB, Ulster, DkIT;
- Large industrial consumers (PayPal, AFC, (All Ire)) supported by DkIT and Ulster;
- Community energy systems (Causeway Coast and Glens Borough Council, NI) supported by Ulster, QUB and DkIT;
- Rural businesses (Ulster Farmers Union, NI) supported by Ulster, DkIT and QUB;

- Domestic energy users (Community Energy Scotland) supported by Ulster;
- Relevant Advisory Board Members: NIE Networks, UREGNI, SONI, Eirgrid (network operation is represented by SSE – a partner).

The Project Partners note that a Commercialisation Manager will seek to ensure that companies of all sizes will be able to access the extensive portfolio of technologies and early-stage ideas/concepts that are available for licencing or in some cases further collaborative development generated with SPIRE 2. They advise that initially, the partner companies will have either exclusive or non-exclusive evaluation licences to allow for a period of time (e.g. six months) to explore further the commercial potential of a particular technology in addition to, for example, Ulster University's Easy Access (free of charge) IP licences up to full royalty-bearing commercial licence arrangements.

The SPIRE 2 project partners have developed a series of 'SMART Activity Targets' (see Section 6.4.1 for details) that they anticipate will be achieved through the implementation of 5 technical Work Packages (WPs 2-6). The remaining work packages are WP1 (Project Management) and WP7 (Communications). Key aims of the 5 technical Work Packages (WPs 2-6) are summarised below:

Table 6.2: Key aspects of the 5 technical Work Packages (WPs 3-7)

WP	Aim
WP 2: Market Models	Aim - develop models of the new electricity markets to inform investment decisions, inform system operators and governments on the potential benefits of MES; quantify how MES/ distributed energy storage' could benefit the region as a whole.
WP3: Technology Development	Aims to optimise existing distributed energy storage technologies for new electricity markets and develop new technologies to achieve greater market penetration.
WP4: Performance of VRE Sources	WP4 will quantify the decline in the performance of VRE generators in harsh environmental conditions over their full life and develop whole-life energy storage sizing solutions.
WP5: Application and Implementation	WP5 will identify and evaluate a range of approaches to integrate distributed energy storage systems into industry, communities, rural businesses and homes. This is addressed by WP5 which draws on knowledge of WP5 and both acts upon and serves WP2 (Market Models) and WP3 (Energy Storage).
WP6: Business Models and Standardisation	WP6 will develop standards for MES/ distributed energy storage and their use these to inform policy/strategy for deployment and create education and research pathways to commercialise technologies and generate new businesses. WP6 will feed into Sections 10 and 11 to facilitate economic growth through a supply of highly educated developers able to transform research ideas into commercial reality.

6.3 Project Expenditure to December 2020

The SPIRE 2 project received a Letter of Offer (dated 21st June 2017) offering a grant of up to a maximum of €6,462,927.86 (ERDF + Government Match Funding) to be expended and claimed by 31st December 2021, towards total anticipated project costs of €6,703,245.67.

As of December 2020, the project had reported total estimated expenditure of €4,449,707, equivalent to 66% of the total project budget. The original projected spend for the same period estimated that 79% of the total project budget would be incurred at this time.

Table 6.3: Project Costs – Anticipated and Estimated Actual December 2020 (€)

Summary Budget	Anticipated Total[87]	Actual to November 2019 Per Project Progress Report[88]	Reported to JS by FLC	Pipeline Expenditure (excluding items deemed ineligible by FLC)	Total Estimated Expenditure at December 2020[89]	% of total budget
Staff Costs	2,745,599	1,322,356	1,486,513	410,326	**1,896,839**	69%
Office and Administration Costs	1,328,748	574,457	654,959	226,653	**881,612**	66%
External Expertise and Services	2,086,900	800,431	959,261	471,126	**1,430,387**	69%
Travel and Accommodation Costs	148,175	19,681	24,469	6,587	**31,056**	21%
Equipment Costs	393,828	187,380	187,406	22,408	**209,814**	53%
Total	**6,703,246**	**2,904,306**	**3,312,608**	**1,137,099**	**4,449,707**	**66%**
Original projected spend level[90]					**5,273,977**	**79%**

[87] Source: Revised Application May 2020
[88] Source: Project Progress Report 11 – 'Total reported'. This was the most recently available collated project progress report.
[89] Source: SEUPB's EMS 14th December 2020
[90] Source: SEUPB's EMS 14th December 2020

6.4 Contribution to the Priority's Specific Objectives and Result Indicators

This section considers the SPIRE 2 project's key achievements and the extent to which the SPIRE 2 project has:

- Contributed to the achievement of the Priority's Specific Objectives; and
- Contributed to the achievement of the targets for the Result Indicators.

The section also identifies any external factors that have impacted, positively or negatively, on the project's ability to contribute to the achievement of the Specific Objective.

6.4.1 Key Achievements (to May 2020[91])

The SPIRE 2 project partners cite the project's key achievements (between March 2019 and May 2020) as being:

Table 6.4: Key Achievements

Period	Dates	Key Achievements/Points of Note
9	1st March 2019 - 31st May 2019	Ulster • 3 x CASE funding applications were submitted with SPIRE 2 stakeholders and potential stakeholders in the energy storage sector. • Ulster attended and presented on SPIRE 2 at UKERC, All-Energy Glasgow. • Attendance at Innovation Hub Sessions and Invest NI Reception at All-Energy Glasgow. • Procurement of Arbarr and Sunamp R&D equipment purchases. • Scoping the purchase of EV to support research needs on SPIRE 2. QUB • Submitted a CASE funding application in the field of energy storage with PowerOn. DkIT • Attendance and paper/poster presentations at IRES 2019 Conference Dusseldorf, Environ 2019 Ireland, EdTech 2019 Ireland, and All Energy Glasgow on research covering auto production and storage, PV systems for potato storage and community attitudes to energy storage. • DkIT through SPIRE 2 was approved to represent Ireland at the International Energy Agency Wind Task 41. University of Strathclyde • Attendance at All-Energy Glasgow 2019 and presentations on Strath SPIRE 2 research.
10	1st June 2019 – 31st August 2019	Ulster • SPIRE 2 Workshops held titled 'How can small scale, consumer-owned, flexible resources engage with wholesale electricity and ancillary services market' and 'The role of infrastructure for heat decarbonisation in NI'. • CASE approved 3 x Ulster led energy storage themed projects. • Attendance at Ulster Doctoral College briefings with SPIRE 2 and NW-CAM on Commercialisation Training.
11	1st September 2019 – 30th November 2019	Ulster • Attendance at SDEWES Croatia with two SPIRE 2 papers presented. • Two 'Strength in Places' funding proposals submitted with Ulster SPIRE 2 energy storage themes. • New template for PhD quarterly research updates distributed.

[91] Please note that the key achievements have been documented in respect to the most recent Partner Project Progress reports that were available to the Evaluation Team at the time of writing. The most recently available collated Project Progress report for the project was for period 11 (September – November 2019).

Table 6.4: Key Achievements		
Period	**Dates**	**Key Achievements/Points of Note**
12	1st December 2019 – 28th February 2020 (from partner progress reports)	Ulster • BBC Radio Ulster interview was broadcasted with SPIRE 2 Academic Dr Aggelos Zacharopoulos on the SPIRE 2 EV and its role in determining the future energy systems and V2G charging. • Northern Ireland Reforming the Energy Vision (NIREV) series of seminars were started. The key aims of NIREV were to determine how distributed energy resources (DER) can have a fundamental role in future systems; and how DER ownership can empower individuals, household, community groups, social enterprises, and businesses. NIREV was to comprise of 4 workshops between December 2019 and May 2020, with a summary report published in Summer 2020. NIREV was jointly funded, supported, and facilitated by the Utility Regulator for NI and the SPIRE 2 project. University of Strathclyde • In this quarter, the research programme was on-going on the erosion characteristics of materials in laboratory simulated wind and tidal turbines, both from an experimental and modelling perspective. The research group also engaged in several outreach activities involving key Industrial and Academic partners in this field. The activities included several meetings including a conference on leading-edge erosion in Denmark, in February 2020 and site visits to various wind farms, (Connemara wind farm, Galway, Scottish and Southern Energy, SSE) and a test site in Dundalk Institute of Technology, December 2019, to gain insights into on-site reliability and materials degradation monitoring. DkIT • PhD students were invited to ZX Lidar's factory in the UK in February to participate in a prototype development trial of a new product which ZX have developed. There were 5 prototypes and only 5 other institutions in Europe invited to participate.
13	1st March 2020 – 31st May 2020 (from partner progress reports)	Ulster • Coronavirus lockdown caused disruption and delays to the SPIRE 2 delivery programme and remedial actions were implemented throughout the partners and stakeholders. • SPIRE 2 RegioStars 2020 application was submitted in the Smart Growth - Industrial Transition for a Smart Europe category. • Climote and Sunamp developed tools and technologies to help support the fight against Covid-19. DkIT • Limitations were placed on progress this quarter and in particular in terms of data gathering and liaison with external stakeholders. However, using data already gathered DKIT researchers submitted further publications and progressed work in a virtual workspace. • In terms of publications in the period, three publications were progressed with one being published.

6.4.2 *Progress towards the Project's Output Indicators*

Table 6.5 provides a high-level summary of the progress that has been made by the SPIRE 2 project towards its Output Indicators.

Table 6.5: Progress towards the Output Targets

Output Code	Description	Programme Target	SPIRE 2 Target	Progress as of July 2020[92]	Variance against project target	Commentary
CO01	Number of enterprises receiving support	20	12	12	100%	Proceeding according to work plan and progress ongoing.
CO02	Number of enterprises receiving grants	10	2	2	100%	Proceeding according to work plan and progress ongoing. Two businesses (Arbarr and Sunamp) have been allocated grants.
CO04	Number of enterprises receiving non-financial support	20	12	12	100%	Proceeding according to the work plan.
CO24	Number of new researchers in supported entities	514	83	57.72	70%	Proceeding behind schedule as a result of QUB PhD exiting the SPIRE 2 project (to take up full-time employment), but the project partners consider that the overall project objectives should not be adversely affected.
CO26	Number of enterprises cooperating with research institutions	10	12	12	100%	Proceeding according to the work plan.
CO41	Number of enterprises participating in cross border, transnational or interregional research projects	10	12	12	100%	Proceeding according to the work plan.
CO42	Number of research institutions participating in cross border, transnational or interregional research projects	5	4	4	100%	Proceeding according to the work plan. Ulster, QUB, Strathclyde and DkIT are participating in cross border, transnational or interregional research projects.

The project lead noted the following *"A number of our original partners are no longer involved as they have either ceased trading or are no longer working in the eligible area. We have other enterprises that we will engage with in case some of our current enterprises have to adjust their focus because of the impact of COVID 19. Although I still think we will deliver the target outputs, there is an elevated risk to some of our enterprises. This will become more apparent as the Government furlough scheme tapers off and enterprise and industries may have to adjust their business models. In the medium to longer-term, COVID-19 may have accelerated the potential growth in the renewables sector."*

[92] Source: SEUPB's quarterly monitoring data.

6.4.3 *Progress towards the Project's Result Indicator Targets*

Per Table 6.6, it is anticipated that the SPIRE 2 Project would contribute 78 peer-reviewed journal and conference publications with cross-border authorship.

Table 6.6: Progress towards Result Indicator Targets

Result Indicator	Programme Target	Project Target	Actual as at July 2019[93]
The number of peer-reviewed journal and conference publications in two target sectors (Renewable Energy and Health & Life Sciences) with cross border authorship and the potential to create economic impact	75	78	15 on a non-cross border basis 6 on a cross border basis

In terms of any potential that the SPIRE 2 project might not achieve its result indicator target by the end of the project period, the project partners note the following (in August 2020):

- SPIRE 2 has 17 PhDs, with supporting researchers and academics. It is a 5-year programme with the expectation of 2 conference publications from the PhD researchers and 2 publications per year per academic team over 5 years. The project partners consider that this general target continues to be achievable.
- However, they note that while they expect to deliver 78 publications, they suggest that

  "It is altogether probable that we will not deliver on 78 peer-reviewed cross border publications. The reasons for this are multi-dimensional with the major contributing factor being that SPIRE 2 has only one cross border academic partner (DkIT) and only one PhD contracted in DkIT.

  An associated issue with cross border publications is the REF peer review system at universities which places demands on the quality and impact of the research publication as well as critical research protocols.

  To address this ongoing work with NIE Networks (wholly owned by SPIRE 2 stakeholders ESB). SPIRE 2 is accessing NIEN data to support several of the SPIRE 2 PhDs project work in the field of networks and electricity systems operation with storage. ESB run on an all-island basis with a policy of cross border cooperation on R&D. Research conducted by SPIRE 2 accessing NIEN data will inform ESB's work across the island on the Integrated Single Electricity Market (iSEM). It should reasonably be assumed that SPIRE 2 work with NIEN is entirely cross border and co-authoring of papers from NIEN staff should comply with cross border publications. This will support the result indicator targets. In addition, SPIRE 2 staff are working across other border institutes and enterprises to address the challenges posed by a lack of border-based entities".

[93] During consultation (on 25/08/2020) SPIRE 2 indicated that it was in the process of reviewing publications up to July 2020, following a publication audit in the previous year (July 2019). It was estimated that at July 2020 SPIRE 2 had 54 peer reviewed publications either published or in draft format.

6.5 Impact of COVID-19

As reflected in Section 2, key findings related to the impact of COVID-19 or otherwise on the SPIRE 2 project include the following:

- Despite the progress made (see Section 6.4), the restrictions associated with the COVID-19 meant that:
  - Various staff across the lead partner's organisation, their project partners or direct beneficiaries commenced working remotely or were furloughed (Arbarr and Sunamp);
  - The project was unable to access laboratories and there have been delays in onsite activities due to lockdown and social distancing measures;
  - Whilst some of the work with enterprise partners was able to continue (such as the top-down modelling of SONI and NIEN data that is required along with the wind curtailment data from ESB), the installation of equipment in NIHE houses has been considerably delayed. NIHE's priority is to ensure that maintenance works are undertaken safely and per social distancing guidance;
  - Expenditure has slowed due to the reduction in travel and some equipment not yet being purchased.
  - Many of the enterprises involved have been focused on survival and the activities in the project have been of lesser priority;
  - However, the project partnership has some concern about the impact of the lockdown periods and restrictions on travel on the mental wellbeing of researchers, particularly concerning students who moved to the UK/Ireland to participate in a Spire 2 project and may feel very isolated with the current situation (lack of friends/family in the country, along with general uncertainty surrounding the situation/project etc.). Consequently, the partnership has endeavoured to increase its contact through remote means with the PhD researchers;
  - Additionally, the partnership notes that some of the student experience has not been as rich as it otherwise would have been.
  - The curtailment of networking and travel may impact students' and researchers' ability to present their work. The project is working to identify other dissemination opportunities;
  - Of note, some COVID-19 research was being undertaken in the research institutes, including antibody testing on campus while other partners worked on the track and trace application with the Irish government and a plumbing-free handwash system.

- Consequently, discussion with the SPIRE 2 project partnership indicates that:
  - The project is behind schedule and there is now a risk that it will not achieve all of its aims and objectives;
  - Following the end of the first period of lockdown, SPIRE 2's PhDs and researchers returned to their laboratories, but on a rota basis to allow for social distancing measures.
  - Nonetheless, most of the planned activities should be delivered but some may not be due to the aforementioned limited site access.
  - However, the partnership is confident that this should not affect the project's ability to achieve their outputs and it would be feasible to make up for the pandemic related delays, as long as they receive an extension. Albeit they note that a second lockdown would cause further delays.
  - They will be able to deliver the entire project within its current budget, albeit the project will likely request flexibility in the budget expenditure profile;

- The Evaluation Team notes that discussion (during December 2020) with SEUPB's Joint Secretariat indicates that it is working closely with each of the Priority Axis 1 projects to establish the impact of the pandemic on their project and their potential requirements (e.g. project extensions). SEUPB's anticipates that it will receive formal feedback on these matters from each of the projects during early 2021. The Joint Secretariat's discussions with the SPIRE 2 project partnership indicates that;

    - The project's outputs are not at risk, but there will likely be delays in completing some of the enterprise engagements.
    - This may also lead to delays for some students in completing their PhD and they may have to review the budget to extend the student for some months.
    - PhD extensions will be required.
    - The area that will be most impacted is travel with associated conference and networking opportunities. The conference circuit has collapsed but some conferences are arranging online alternatives. Students may still have opportunities to present their work online and hopefully return to more normal travel arrangements during 2021;
    - The partnership considers that it is very likely that they will need to extend the project (by circa 3 to 6 months) to give them the best chance to complete the outputs, albeit this timeline may be influenced by a further period of lockdown.

6.6 Impact on Business and Industry

This section considers the impact of the SPIRE2 project on business and industry within the eligible region.

As might be expected given the interim nature of the project's implementation and the continued focus in carrying out the research aspects of the project, the tangible impact of the project on business and industry (in terms of generating outputs and outcomes) can only be measured in the longer term and will be a core focus of the Evaluation Team's next tranche of research.

Notwithstanding this, anecdotal feedback from the Project Partners suggests that the project has served to (at least in part):

- Increase businesses' knowledge and understanding of the benefits of working collaboratively with academic institutions which may result in the development of longer-term working relationships;
- Linked to the previous point, the Project Partners note that businesses have developed a greater understanding of the respective research strengths and capabilities that exists within the academic institutions;
- Increase academia's understanding of the needs of industry; and
- Support businesses to take forward commercially focused R&D which may not have been undertaken due to their capacity and capability.

7. ECME - EASTERN CORRIDOR MEDICAL ENGINEERING CENTRE

7.1 Introduction

This section of the report considers the ECME (Eastern Corridor Medical Engineering Centre) project, which was awarded grant funding under Priority Axis 1a – Enhancing Research and Innovation, Specific Objective 1.1 – Increasing business and industry-relevant research and innovation capacity across the region.

7.2 Project Overview

The eligible region has recognised business export excellence within the target market of remote patient diagnostics; and has research excellence in the key disciplines of medical engineering, data analytics and diagnostic systems. By specifically taking all the various specialisms under one project, it is envisaged that there will be an enhanced critical mass of expertise that should lead to industry innovation, informed by research and development.

To this end, ECME represents a collaboration between the two main centres within the Island of Ireland in Intelligent Sensor Technology, namely:

- Ulster University's (UU) Nanotechnology and Integrated Bio-Engineering Centre (NIBEC), in conjunction with UU's Computer Science Research Institute (CSRI); and
- Dublin City University's (DCU) Biomedical Diagnostics Institute (BDI), in conjunction with:
  - Dundalk Institute of Technology (DkIT); and
  - University College Dublin's (UCD) Connected Health programme, incorporating the Applied Research for Connected Health Centre (ARCH) and the Insight Centre for Data Analytics (INSIGHT, Prof Brian Caulfield).

The project also incorporates a new partnership with the University of the Highlands and Islands' (UHI) Department of Diabetes and Cardiovascular Science to complement the work with a strong underpinning of cardiovascular research. The main clinical partner is the Cardiac Research Centre at NI's Southern Trust (ST, Craigavon).

This newly formed 'ECME Alliance' intends to work closely with a range of industrial and clinical partners as a means of translating collaborative science into clinical and market-led innovative products and systems for enhanced healthcare applications.

The ECME project involves several key activities, that are captured within seven work packages, with the research and innovation activities grouped into five[94] separate work packages based around an industry-informed challenge. The project also includes a communication/dissemination strategy that seeks to optimise the potential economic benefits of the envisaged newly developed know-how.

The Project's aims are:

- To implement a cross border centre of critical mass and excellence that will enable the partner research institutes to improve their credibility and standing in the international community through jointly published cutting-edge research in the field of remote patient monitoring;
- To provide a new business integration mechanism that demonstrates the economic benefit of RI-led approaches to industry-identified issues, with commercialisation foreseen through spinouts and new product development in industry partner businesses;
- To provide a big data structure and database that will enable future joint working amongst partners to enrich the validity of health and life science solutions developed;

[94] The five research and innovation work packages are as follows: 1. Cardiac Big Data R&I, 2. Smart Wearables founded in Connected Sensor R&I, 3. Rapid Homecare Point of Care Diagnostics R&I, 4. Ambient Assisted Living (AAL) Home-Based Self-Management R&I and 5. Self-Management/ Rehab.

- To develop leaders of the future through the industry and innovation enriched and informed PhD studentships;
- To set-up a tri-jurisdiction research collaboration in cardiac sensors, diagnostics and data analytics. We aim to develop this into an internationally leading doctoral training and innovation centre, with critical mass that allows global recognition, high-quality leadership development and excellent Industry interactions.

The partnership had previously been highly successful at influencing EU and global impact within their respective areas. It is anticipated that the ECME project will provide the partnership with the impetus and funding to work collectively to make a step change to where industry and academia are placed in the globally competitive remote patient monitoring market. The various PhD projects and RA innovation projects that comprise the ECME Centre projects were informed through the partnership's experience and consultation with industry leaders.

It is anticipated that the project will involve 24 PhDs delivered over three and four year periods with varying technology ready levels, which will feed into and shape five demonstrator platforms (developed and co-ordinated by three RAs, a Business Integration Manager and industry) that specifically address five key industry issues. The following TRL (Technology Readiness Levels) and industry engagement are envisaged by work package:

Table 7.1: TRL Levels of each Work Package

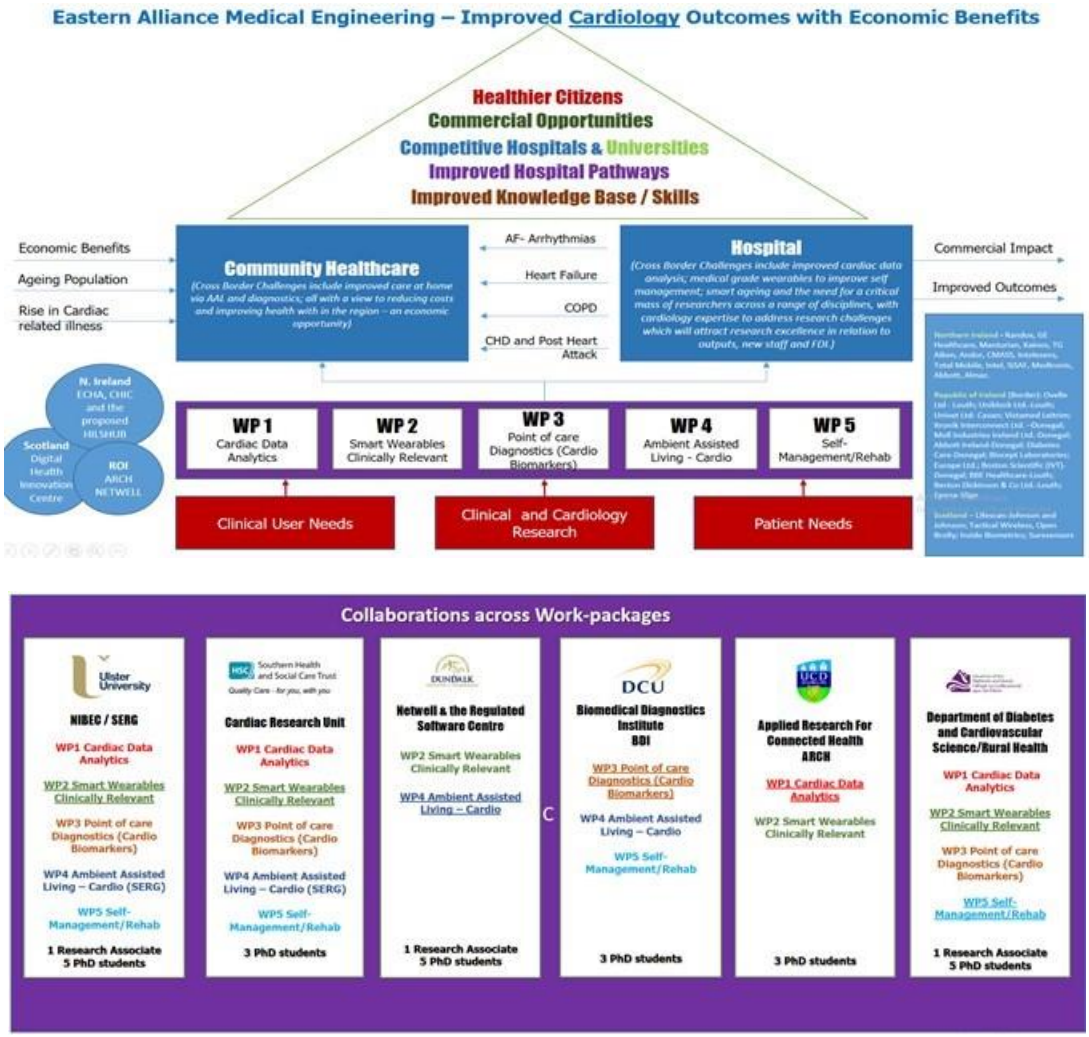
WP	PhD TRL		RA Platform TRL		Potentially core Industry and Clinical Collaborators
	PhD at Project Start	PhD at Project End	RA at Project Start	RA at Project End	
1. Cardiac Data Analytics	TRL 2	TRL 4	TRL 3	TRL 6	ST, Randox, Heartsine, Intelesens, Kainos, Armstrong Medical.
2. Smart Wearables	TRL 3	TRL 4	TRL 3	TRL 6	ST, Intelesens, CIGA, Epona, Heartsine, Abbott.
3. POC Diagnostics	TRL 1	TRL 4	TRL 2	TRL 6	ST, JandJ, Abbott, Epona, Randox, SiSaf, Armstrong Medical, JandJ, LifeScan.
4. Ambient Assisted Living – Cardio	TRL 3	TRL 5	TRL 3	TRL 6	ST, Total Mobile, Intelesens, Kainos, Heartsine.
5. Self-Management/ Rehab	TRL 3	TRL 5	TRL 3	TRL 6	ST, Intelesens, Heartsine, Total Mobile.

It is anticipated that the PhD students will acquire transferable skills such as research management and communication skills that will shape their training and career development to best position them for their future careers. The programmes feature three network-wide transferrable skills modules (Inter-sectoral Communication (including IP management); Innovation in an emerging market; Working with patient populations: ethics, access and clinician engagement.

The overall project will continuously take cardiac specialist clinical direction and advice from 3 Southern Trust cardiologists, along with NHS Scotland and ROI HSE input. A range of PhD projects will be managed by the clinicians and PhD students will be continuously introduced into the clinical environment with some placements possible in their final years.

An overview of the proposed project structure, partners, drivers and outputs is provided below:

Figure 7.1: The overall structure, partners, drivers and outputs of ECME.



7.3 Project Expenditure to December 2020

The ECME project received a Letter of Offer (dated 21st June 2017) offering a grant of up to a maximum of €8,151,717.53 (ERDF + Government Match Funding) to be expended and claimed by 31st December 2021, towards total anticipated project costs of €8,362,917.13.

As of December 2020, the project had reported total estimated expenditure of €4,737,172, equivalent to 57% of the total project budget. The original projected spend for the same period estimated that 72% of the total project budget would be incurred at this time.

Table 7.2: Project Costs – Anticipated and Estimated Actual December 2020 (€)

Summary Budget	Anticipated Total	Actual to November 2019 Per Project Progress Report[95]	Reported to JS by FLC	Pipeline Expenditure (excluding items deemed ineligible by FLC)	Total Estimated Expenditure at December 2020[96]	% of total budget
Staff Costs	1,823,867	735,626	753,565	383,176	**1,136,741**	51%
Office and Administration Costs	1,442,750	621,375	637,218	278,846	**916,063**	61%
External Expertise and Services	4,458,185	1,667,011	1,709,697	622,679	**2,332,376**	58%
Travel and Accommodation Costs	137,306	27,299	28,582	4,177	**32,758**	26%
Equipment Costs	500,809	173,475	174,937	144,295	**319,232**	62%
Total	**8,362,917**	**3,224,786**	**3,303,999**	**1,433,173**	**4,737,172**	**57%**
Original projected spend level[97]					**5,979,953**	**72%**

[95] Source: Project Progress Report 11 – 'Total reported'. This was the most recently available collated project progress report.
[96] Source: SEUPB's EMS 14th December 2020
[97] Source: SEUPB's EMS 14th December 2020

7.4 Contribution to the Priority's Specific Objectives and Result Indicators

This section considers the ECME project's key achievements and the extent to which the ECME project has:

- Contributed to the achievement of the Priority's Specific Objectives; and
- Contributed to the achievement of the targets for the Result Indicators.

The section also identifies any external factors that have impacted, positively or negatively, on the project's ability to contribute to the achievement of the Specific Objective.

7.4.1 Key Achievements (to May 2020[98])

The ECME project partners cite the project's key achievements (between December 2018 and May 2020) as being:

Table 7.3: Key Achievements

Period	Dates	Key Achievements/Points of Note
8	1st December 2018 – 28th 31st February 2019	• During this reporting period, the project was focussed on embedding the training and networking requirements of the project, kick-starting the collaborative publishing of research papers, and starting the industrially focussed parts of the project. • The first cross border output was published and presented during this period at the Scottish Cardio-Vascular Forum between UHI and DKIT on The Effectiveness of Various Types of Wearable Technology. • The Industry workshop held at UHI focussed on Big data and was attended by 7 organisations. • The Business Collaboration Manager Post was advertised.
9	1st March 2019 – 31st May 2019	• The project continued to focus on the collaborative cross border publication element of the project and had 4 cross border papers published and 19 planned. • The project lead attended the St Patrick's day event in Brussels to discuss the benefits of the project to representatives of the European Commission.
10	1st June 2019 – 31st August 2019	• During this period, the project had a 2-day workshop at DKIT focussed on industry engagement and joint publications. There was a range of high-quality speakers on a variety of topics including innovation in the healthcare technology sector, design thinking and ECME project highlights to date. • Artificial Intelligence (AI) training was delivered to five businesses including PwC, Kainos, BeSecure, axial3D, and Almac. • Research continued on the PhD projects and the team attended an EU showcase in Scotland to demonstrate the impact of the ECME project.
11	1st September 2019 – 30th November 2019	• During this reporting period, the PhD projects continued to make progress except for the one in the smart wearables category who left on a leave of absence. • The project held a mid-term away day/review and developed a plan for the second half of the project. • The project exhibited at 2 AI-focused conferences with around 1,000 delegates attending the combined conferences.
12	1st December 2019 – 28th 31st February 2020 (from partner progress reports)	<u>UHI</u> • A tender was submitted to deliver a workshop in Summer 2020 for the benefit of ECME staff and students, as well as company representatives. • The Health Literacy PhD Project was invited to become a World Health Organisation national health literacy demonstrator project.

[98] Please note that the key achievements have been documented in respect to the most recent Partner Project Progress reports that were available to the Evaluation Team at the time of writing. The most recently available collated Project Progress report for the project was for period 11 (September – November 2019).

Table 7.3: Key Achievements		
Period	**Dates**	**Key Achievements/Points of Note**
13	1st March 2020 – 31st May 2020 (from partner progress reports)	UU • During this reporting period, the project had to adapt to the new working conditions that the COVID-19 pandemic had imposed. PhD researchers and research associates were in most cases working remotely. • Where possible, some of the research pivoted towards the new pandemic to ensure that the project was helping to carry out the most impactful research possible whilst meeting the objectives of the project. The project altered the industrially focused mini-projects to focus on solutions to the World Health Organisation's identified challenges facing our society. This resulted in the formation of 9 projects, which were awarded up to €30k each in late May. UHI • Despite all of the Covid-19 disruption, there were several publication successes, some of which were cross-border.

7.4.2 Progress towards the Project's stated Objectives

Table 7.4 provides a summary of the progress that has been made by the project against its stated objectives.

Table 7.4: Project Specific Objectives[99]		
Project Specific Objectives	**Level of Achievement**	**Explanation**
To create a cross-border centre of research competence and excellence within the field of cardiovascular medicine by March 2017	To a minor degree	The partners have been collaborating on a variety of publications and joint initiates. They had also started to plan some future projects to ensure the ongoing sustainability of the project.
To undertake excellent research (commencing at TRL levels of between 1 and 3), through the creation of 24 PhD studentships	To a minor degree	The PhD researchers had continued to carry out their research projects and work on a variety of PhD related activities.
To engage with ten industry partners at TRL levels of between 2 and 6.	To a minor degree	The project had started to engage with a range of partners and planned the grant award element of the project and a range of Industry related events including a large-scale conference.

[99] Source: Project Progress Report 11 – 'Total reported'. This was the most recently available collated project progress report.

7.4.3 *Progress towards the Project's Output Indictors*

Table 7.5 provides a high-level summary of the progress that has been made by the ECME project towards its Output Indicators (as of September 2020).

Table 7.5: Progress towards the Output Targets							
Output Code	**Description**	**Programme Target**		**ECME Target**	**Progress as of September 2020[100]**	**Variance against project target**	**Commentary**
C001	No. of enterprises receiving support		20	**10**	0	0%	In progress and proceeding according to the work plan
C002	No. enterprises receiving grants		10	**5**	5	100%	Proceeding according to Work Plan. Achieved and ongoing.
C004	No. enterprises receiving non-financial support		20	**10**	0	0%	In progress and proceeding according to the work plan. For example, Artificial Intelligence (AI) training has been delivered to five businesses including PwC, Kainos, BeSecure, axial3D, and Almac.
C024	No new researchers in supported entities	T1.8.1		**21**	65	68%	Proceeding according to work plan
		T2.1.1		**21**			
		T3.1.1		**21**			
		T4.1.1		**17**			
		T5.1.1		**15**			
		Total FTEs	514	**95**	**65**	**68%**	
C026	No. enterprises cooperating with RIs		10	**10**	5	50%	Proceeding according to Work Plan.
C041	No. enterprises participating in cross-border research projects		10	**10**	5	50%	Proceeding according to Work Plan.
C042	No. research institutions participating in cross-border research projects		10	**5**	5	100%	Proceeding according to Work Plan. Achieved and ongoing.

[100] Source: SEUPB's quarterly monitoring data.

7.4.4 Target Groups Reached

The Evaluation Team's review of the ECME's LoO and Progress reports indicate that the project was not allocated target group targets.

7.4.5 Progress towards the Project's Result Indicator Targets

In August 2020, the ECME project partners report that the project has created 20 peer-reviewed journal and conference publications with cross-border authorship. The Project Partners have indicated that the target to create 81 cross-border publications will be challenging due to the multi-disciplinary partners engaged in the project.

Table 7.6: Progress towards the Result Indicator Targets		
Category	**ECME Target**	**Progress (at August 2020[101])**
Joint cross-border papers published	81	20

Table 7.7 (overleaf) provides a list of the cross-border publications produced.

[101] Source: Consultation with project lead (21/08/2020).

Table 7.7: ECME cross border publications			
Name of Lead Institution	**Title**	**Authors & Organisations**	**Publication Year**
Dublin City University	Reactive Oxygen Species (ROS), Intimal Thickening, and Subclinical Atherosclerotic Disease	Denise Burtenshaw1†, Michael Kitching2†, Eileen M. Redmond3, Ian L. Megson4 and Paul A. Cahill 1* 1 Vascular Biology & Therapeutics, School of Biotechnology, Dublin City University, Dublin, Ireland, 2 School of Chemistry, Dublin City University, Dublin, Ireland, 3 Department of Surgery, University of Rochester, Rochester, NY, United States, 4 Centre for Health Science, UHI Institute of Health Research and Innovation, Inverness, United Kingdom	2019
Ulster University	Unobtrusive Measurement of Upper Extremity Velocity During Post-Stroke Rehabilitation Exercises	Idongesit Ekerete[1], Chris Nugent[1], Oonagh M Giggins[2], Matias Garcia-Constantino[1], James McLaughlin[3]. [1] School of Computing, Ulster University. [2] Dundalk Institute of Technology, Rep. of Ireland. [3]NIBEC, Ulster University.	2019
Ulster University	Unobtrusive Sensing Solution for Post-stroke Rehabilitation	Idongesit Ekerete[1], Chris Nugent[1], Oonagh M Giggins[2], James McLaughlin[3]. [1] School of Computing, Ulster University. [2] Dundalk Institute of Technology, Rep. of Ireland. [3]NIBEC, Ulster University.	2020
Ulster University	Unobtrusive Monitoring of Home-Based Post-Stroke Rehabilitation Exercises Using Heterogeneous Sensors	Idongesit Ekerete, Chris Nugent[1], Oonagh M Giggins[2], Ian Cleland[1], James McLaughlin. School of Computing, Ulster University. [2] Dundalk Institute of Technology, Rep. of Ireland. [3]NIBEC, Ulster University.	2020
Ulster University	Detection and Categorisation of Multilevel High-sensitivity Cardiovascular Biomarkers from Lateral Flow Immunoassay Images via Recurrent Neural Networks	Min Jing (UU), Donal McLaughlin (UCL), David Steele (BioColor Ltd), Sara McNamee (UU), Brian Mac Namee (UCD), Patrick Cullen (UU), Dewar Finlay (UU) and James McLaughlin (UU)	2019
Ulster University	Enhance Categorisation Of Multilevel High-Sensitivity Cardiovascular Biomarkers From Lateral Flow Immunoassay Images Via Neural Networks And Dynamic Time Warping	Min Jing (UU), Brian Mac Namee (UCD), Donal McLaughlin (UCL), David Steele (BioColor Ltd), Sara McNamee (UU), Patrick Cullen (UU), Dewar Finlay (UU) and James McLaughlin (UU)	2020
Ulster University	ST Changes Observed in Short Spaced Bipolar Leads Suitable for Patch Based Monitoring	Michael Jennings (UU), Daniel Guldenring (HTWB), Raymond Bond (UU), Ali Rababah (UU), Jim McLaughlin (UU), Dewar D Finlay (UU)	2020
Ulster University	Coefficients for the Derivation of Posterior and Right-Sided Chest Leads from the 12-lead ECG (abstract accepted)	Michael Jennings (UU), Ali Rababah (UU), Pardis Biglarbeigi (UU), Rob Brisk (CAH/UU), Daniel Guldenring (HTWB), Jim McLaughlin (UU), Dewar D Finlay (UU)	
University of the Highlands and Islands	Digital technologies for risk factor modification in patients with cardiovascular disease: a systematic review and meta-analysis.	Adewale S. Akinosun1, Robert Polson2, Yohanca Diaz4, Hannes De Kock1, Lucia Carragher4, Stephen J. Leslie3, Mark Grindle1. 1Digital Health, Centre for Health Science, Institute of Health Research and Innovation, University of the Highlands and Islands, Inverness, UK (PhD Researcher and Senior Lecturer); 2Highland Health Science Library, University of the Highlands and Islands, Inverness, UK (Subject Librarian); 3Cardiac Unit, NHS Highland, Inverness, UK (Consultant Cardiologist, Professor); 4School of Health and Science, Dundalk Institute of Technology, Dundalk, RoI (PhD Researcher and Senior Research Fellow).	2020
University of the Highlands and Islands	Digital storytelling for cardiovascular disease risk factor modification: a scoping review.	Adewale S. Akinosun1, Robert Polson2, Noreen Grant1, Ania Zubala1, David Coyle4, Stephen J. Leslie3, Mark Grindle1. 1Digital Health, Centre for Health Science, Institute of Health Research and Innovation, University of the Highlands and Islands, Inverness, UK (PhD Researchers, Research Fellow and Senior Lecturer); 2Highland Health Science Library, University of the Highlands and Islands, Inverness, UK (Subject Librarian); 3Cardiac Unit, NHS Highland, Inverness, UK (Consultant Cardiologist, Professor); 4School of Computer Science, Science Centre, University College Dublin, Belfield, Dublin, Republic of Ireland (Associate Professor)	2020

Table 7.7: ECME cross border publications			
Name of Lead Institution	**Title**	**Authors & Organisations**	**Publication Year**
Dublin City University	Reactive Oxygen Species (ROS), Intimal Thickening, and Subclinical Atherosclerotic Disease	Denise Burtenshaw(DCU) Michael Kitching2†, Eileen M. Redmond3, Ian L. Megson (UHI) and Paul A. Cahill1*	2020
Dundalk Institute of Technology	Enablers and obstacles to implementing remote monitoring technology in cardiac care _ A report from an interactive workshop	Yohanca D. DKIT David McQuaid Oonagh Giggins Paul Beaney (UU)	2019
Ulster University	Novel Hybrid Method for Interpolating Missing Information in Body Surface Potential Maps	Ali S.Rababah Msca (UU) Raymond R.Bond PhD Khaled Rjoob Msc Daniel Guldenring PhD (Hochschule für Technik und Wirtschaft, Berlin, Germany) James McLaughlin PhD Dewar D.Finlay PhD	2019
Ulster University	Interpolating Low Amplitude ECG Signals Combined with Filtering According to International Standards Improves Inverse Reconstruction of Cardiac Electrical Activity	Ali S.Rababah (UU) Khaled RjoobMscLaura Bear (University of Bordeaux) James McLaughlin Dewar D.Finlay	2019
Ulster University	Effects of Interpolation on the Inverse Problem of Electrocardiology	YS Dogrusoz, L R Bear, (University of Bordeaux) J Bergquist, Dubois, W Good, S MacLeod, A Rababah,(Ulster University) and J Stokes	2019
Ulster University	Data-Driven Feature Selection and ML to Detect Misplaced Chest Electrodes	Khaled Rjoob, RR Bond, D Finlay, V. E. McGilligan, Stephen James Leslie (UHI) Aleeha Iftikhar, D Guldenring (Hochschule für Technik und Wirtschaft, Berlin, Germany), Ali Rababah (Ulster University) Charles Knoery, Anne McShane, Aaron Peace	2020
UHI / DKIT	State of play of wearable devices for the measurement of Heart Rate: A systematic review of the accuracy of wrist-worn technologies.	David Muggeridge (UHI) Oonagh Giggins (DKIT)	2019
University of the Highlands and Islands	Clinical Application of Physical Activity Monitoring in Patients with Cardiovascular Implantable Electronic Devices (CIEDs)	K. Callum, D.J.Muggeridge, O.M.Giggins, D.Crabtree, T.Gorely & S.J.Leslie	2020
University of the Highlands and Islands	Oxidative stress and inflammation in the development of cardiovascular disease and contrast-induced nephropathy	Karla Cervantes-Gracia,*, Khuram Raja,*, Daniel Llanas-Cornejo, James N. Cobley2, Ian L. Megson, Richard Chahwan, Holger Husi	2020
University of the Highlands and Islands	Establishing the efficacy of interventions to improve health literacy and health behaviours: a systematic review	Ronnie Walters (UHI), Stephen Leslie (UHI), Rob Polson (UHI), Tara Cusack (UCD), Trish Gorely (UHI)	2020

7.5 Impact of COVID-19

As reflected in Section 2, key findings related to the impact of COVID-19 or otherwise on the ECME project include the following:

- Despite the progress made (see Section 7.4), the restrictions associated with the COVID-19 meant that:
  - Various staff across the lead partner's organisation, project partners or direct beneficiaries started working remotely. Some of the project beneficiaries' staff were paced on furlough;
  - Some project partners and direct beneficiaries switched focus to begin producing PPE to help address the spread of COVID-19.
  - There have been limited opportunities to collaborate to produce cross-border publications
  - Some projects have not been able to carry out research/testing, due to laboratory facilities having to close and a reduction in access to patients, albeit some researchers were able to undertake aspects of the project remotely;
  - ECME repurposed the Grants to Industry to meet the needs emerging from the COVID-19 pandemic. It is anticipated that the approved projects will complete before the end of 2020;
  - The project partnership is particularly thankful for SEUPB allowing them to pivot the project (by offering the COVID projects) which are considered to have been of great help in helping the project meet its targets and keep the team productive;
  - In some cases, activity under the Platform Technology Development with Post-Doc Researchers: has accelerated. For example, Min Jing's work on COVID-19 modelling to assist in the decision making process for clinicians in Northern Ireland.
  - The ECME conference was cancelled. The project instead plans to hold some online workshops and seminars for PhD students to present conference publications.

- Consequently, discussion with the ECME project partnership indicates that:
  - The project is behind schedule and there is a risk it will not achieve its aims and objectives;
  - It may not be feasible to deliver the project's planned activities within the original timeframe as some projects may not be able to carry out research/testing, due to laboratory facilities having to close. However, it was noted that researchers were working remotely, and the project was hopeful that they will be able to make up their delays;
  - However, the project lead noted that the pandemic may jeopardise the expected results of the project, particularly the joint publications as meetings are not possible in the same way they were pre-pandemic, and they are unable to attend conferences. It was further noted that the project's researchers were unable to access laboratories and patients, whilst training had to be carried out digitally which may make the project outcomes less impactful.

- The Evaluation Team notes that discussion (during December 2020) with SEUPB's Joint Secretariat indicates that it is working closely with each of the Priority Axis 1 projects to establish the impact of the pandemic on their project and their potential requirements (e.g. project extensions). SEUPB's anticipates that it will receive formal feedback on these matters from each of the projects during early 2021. The Joint Secretariat's discussions with the ECME project partnership indicates that;
  - Some PhD students were placed on a leave of absence so the project will require an extension to allow those students to complete their PhDs.
  - There will be significant savings in the travel budget which ECME will seek to use to fund an extension;
  - The project partnership continues to believe that it can meet the project's output targets. The key risk is to PhD researchers who need to access labs or patient cohorts to complete their PhD work. Partners will likely be able to complete their researcher hours requirements provided a project extension can be provided when necessary.

- The gap in lab-based and clinical work will make it challenging to meet the objectives within the original timeframe. Also, the lack of conferences at which to publish papers will put pressure on the cross border publications aspect of the project.
- The project will likely require a 3-6 month extension, depending on what budget savings they have.
- If an extension is not granted, then there is a risk to the research outcomes, the achievement of objectives and outputs and result indicator.

7.6 Impact on Business and Industry

This section considers the impact of the ECME project on business and industry within the eligible region.

During consultation, the ECME Project Partners indicated that, to date, businesses direct engagement in the project is in its infancy. As such, and given the continued focus in carrying out the research aspects of the project, the tangible impact of the project on business and industry (in terms of generating outputs and outcomes) can only be measured in the longer term and will be a core focus of the Evaluation Team's next tranche of research.

Notwithstanding this, anecdotal feedback from the Project Partners suggests that the project has served to (at least in part):

- Increase levels of businesses' knowledge in the area of AI which has been identified as a growth area within the healthcare sector; and
- Enhance the knowledge and skillsets of a PhD student and, in doing so, prepare them to meet the needs of industry in the future.

8. BREATH - BORDER AND REGIONS AIRWAYS TRAINING HUB

8.1 Introduction

This section of the report considers the BREATH (**B**order and **RE**gions **A**irways **T**raining **H**ub) project, which was awarded grant funding under Priority Axis 1a – Enhancing Research and Innovation, Specific Objective 1.1 – Increasing business and industry-relevant research and innovation capacity across the region.

8.2 Project Overview

The BREATH (**B**order and **RE**gions **A**irways **T**raining **H**ub) project is an ambitious, collaborative research Partnership that is seeking to harness the complementary resources and expertise of 10 Principal Investigators (PIs) from Dundalk Institute of Technology (DkIT), Queen's University Belfast (QUB) and the University of the West of Scotland (UWS) with a mission *"to establish a cross-border research hub for the development of innovative approaches to tackle COPD by identifying new targets and treatments, establishing an interregional PhD training network and fostering industry-linked research capacity in the Eligible Region".*

To this end, the project partners have proposed to develop an innovative, industry-relevant training programme to stimulate R&I, attract inward investment and enhance economic development in the Region.

The project combines the project partners' expertise in airway smooth muscle (DkIT), epithelial and neuronal function (QUB) and inflammation (UWS) that is considered to be required to develop novel early diagnostic tests and treatments for COPD. It is anticipated that QUB clinicians will ensure that BREATH research is patient-focused. The project partners consider that the strength of BREATH will be to draw together cross-regional expertise in airways cell biology, biomarker discovery and inflammation providing a hitherto unavailable opportunity to develop innovative new skills and models related to COPD.

The need for the project has been informed by the project partners' consultations with medical experts, patient groups, government depts/policymakers, politicians and industry. Indeed, according to the project partners, despite the high prevalence of COPD and the associated mortality and morbidity within the Region, there has been almost no research or training provision in this field. They suggest that this is in stark contrast to other lung diseases such as asthma, cystic fibrosis, lung cancer and Acute Lung Injury where significant progress in developing training structures and advancing early drug discovery has been made.

BREATH will focus its research on COPD both to directly address the first area of need identified, but also serve as a vehicle for delivering solutions to the other specific needs identified.

The BREATH management structure comprises:

- Management Board, responsible for overall management;
- Finance Committee;
- Scientific Supervisory Board responsible for recruitment and progress monitoring;
- External Advisory Committee to inform and advise on cross-border and interregional business development.

Four work plans have been developed.

Table 8.1: Summary of BREATH Project Work Plans (Per Progress Reports)
1. Management (management)
2. Scientific Research Projects
3. Technology Transfer Activities
4. Communication.

8.3 Project Expenditure to December 2020

The BREATH project received a Letter of Offer (dated 21st June 2017) offering a grant of up to a maximum of €7,734,796.64 (ERDF + Government Match Funding) to be expended and claimed by 31st December 2021, towards total anticipated project costs of €8,515,073.09.

However, this was later amended (LoO dated 21st June 2017)[102] offering a grant of up to a maximum of €7,727,271.20 (ERDF + Government Match Funding) to be expended and claimed by 31st December 2021, towards total anticipated project costs of €8,506,928.97.

As of December 2020, the project had reported total estimated expenditure of €6,147,545, equivalent to 72% of the total project budget. The original projected spend for the same period estimated that 73% of the total project budget would be incurred at this time.

Table 8.2: Project Costs – Anticipated and Estimated Actual December 2020 (€)

Summary Budget	Anticipated Total	Actual to June 2019 Per Project Progress Report[103]	Reported to JS by FLC	Pipeline Expenditure (excluding items deemed ineligible by FLC)	Total Estimated Expenditure at December 2020[104]	% of total budget
Staff Costs	3,019,364	1,136,211	1,331,770	974,173	**2,305,943**	76%
Office and Administration Costs	1,651,386	675,355	768,381	459,338	**1,227,719**	74%
External Expertise and Services	3,220,314	1,079,182	1,243,317	841,591	**2,084,909**	65%
Travel and Accommodation Costs	134,406	45,334	55,189	22,721	**77,909**	58%
Equipment Costs	481,459	445,842	448,676	2,389	**451,066**	94%
Total	**8,506,929**	**3,381,924**	**3,847,333**	**2,300,212**	**6,147,545**	**72%**
Original projected spend level[105]					**6,198,640**	**73%**

[102] Following identification of an error in the figures approved for the office and administration budget.
[103] Source: Project Progress Report 10 – 'Total reported'. This was the most recently available collated project progress report.
[104] Source: SEUPB's EMS 14th December 2020
[105] Source: SEUPB's EMS 14th December 2020

8.4 Contribution to the Priority's Specific Objectives and Result Indicators

This section considers the BREATH project's key achievements and the extent to which the BREATH project has:

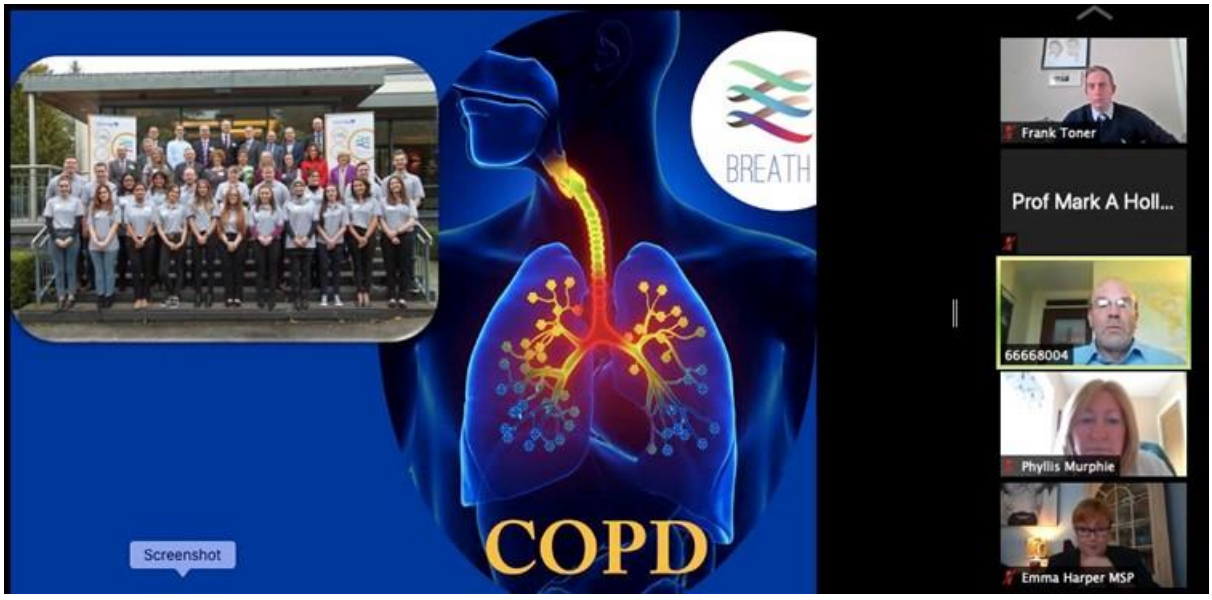
- Contributed to the achievement of the Priority's Specific Objectives; and
- Contributed to the achievement of the targets for the Result Indicators.

The section also identifies any external factors that have impacted, positively or negatively, on the project's ability to contribute to the achievement of the Specific Objective.

8.4.1 Key Achievements (to November 2020)

Despite the annual BREATH Conference 2020 which was to be held in UWS Scotland being cancelled due to COVID-19, UWS hosted a very successful Virtual Conference in collaboration with TEVA UK Ltd. TEVA UK Ltd has been instrumental in the drugs associated with easing the symptoms of COVID-19 and details of this and other projects they have been involved with have been shared with the students and project staff.

The project presented to the Scottish Parliament Cross Party Group for Lung Health on the 21 September 2020. This was well received and attracted a large virtual audience.



The Project also hosted several training webinars during the lockdown period to ensure that the training of the researchers continued. As a result of this, several clinical affiliates agreed to further this training in July 2020. The project partners consider that this has been very beneficial to help maintain student engagement.

Due to restrictions in place for COVID-19, researchers have returned to the labs on a split-shift basis. However, some project partners are experiencing delays in research work due to being unable to access the lab space during the lockdown period and are currently considering the possibility of needing to extend contracts. It is understood that this will be considered by SEUPB in due course.

With the upsurge in homeschooling due to COVID-19, the BREATH team have now revised the formal class BREATH Challenge into a form for use as a homeschooling exercise. While originally intended as a class exercise, children (and parents) have now been invited to individually download and engage in the various challenges. Successful completion of all the challenges results in an award of a 'Certificate of Success'.

The project's collaboration with Almac Discovery was due to begin in October 2020. Almac's researchers are considered key workers and have had access to their research labs throughout the pandemics. If this were to change, outputs from this collaboration could be delayed.

The BREATH project partners cite the following project achievements (between January 2018 and June 2020) within their Quarterly Project Progress Reports: [106]

Table 8.3: Key Achievements

Period	Dates	Key Achievements/Points of Note
5	1st January 2018 - 31st March 2018	• The Outreach Programme continued, and all institutes were involved in multiple activities (DkIT: St Joseph's Primary School, Carryduff, QUB: NI Science Festival and UWS: St Joseph's Academy Dumfries, St John's Primary Stevenson, Stranraer Academy). The outreach was considered to have been hugely successful with specially designed, interactive family and student COPD activities. • The BREATH application was shortlisted for the 2018 NI Healthcare Awards and Prof. Martin was invited to attend for interview (24th January 2018). The Awards Dinner, which was attended by PIs from DkIT, QUB, and UWS, was held in the Europa Hotel on 22nd February 2018 where the BREATH team was awarded Asthma/COPD Project of the Year.
6	1st April 2018 - 30th June 2018	• BREATH PhD students undertook training in IP and commercial exploitation of their scientific data. • Sentinus provided two training sessions at DkIT which allowed the students to develop relevant outreach resources for use in schools Public Engagement/Outreach.
7	1st July 2018 - 30th September 2018	• Dr Claire Delvin appointed as PDRA to the programme on 1st Sept 2018. • A major milestone that was achieved over this period was the provision of a start certificate by the Belfast Trust which would allow the collection of bronchial brushings and lavage samples by QUB PI from consented patients. This was the second stage of a lengthy research ethics process that required first approvals from the Office for Research Ethics and then research governance permissions from the health trust. The research ethics approval also covered the collection of samples by clinicians in Dumfries and Ayrshire. Students across the BREATH project benefitted from having access to human airway epithelial cells and lavage samples from well characterised patient cohorts.
8	1st October 2018 - 31st December 2018	• Students participated at the Irish Thoracic Society Annual Conference (Belfast, 23rd-24th Nov 2018). The conference was attended by the whole BREATH team (DkIT, QUB, UWS) and all 16 students had the opportunity to present their work. Oral presentations and resulting publications in the Irish Journal of Medical Science (6 out of 16 total BREATH presentations at the meeting). • Interviews and appointment of BREATH DkIT Research Assistant. • BREATH PhD students provided presentations to the 'Open Doors' event attended by school principals, guidance councillors and industry representatives (e.g. WuXi Biologics). • BREATH Outreach Student (from Our Lady and St Patrick's College, Knock) won the Work Experience Shield Senior School prize day (Dec 2018).

[106] Please note that the key achievements have been documented in respect to the most recent Partner Project Progress reports that were available to the Evaluation Team at the time of writing. The most recently available collated Project Progress report for the project was for period 10 (April – June 2019).

Table 8.3: Key Achievements		
Period	**Dates**	**Key Achievements/Points of Note**
9	1st January 2019 - 31st March 2019	• The motion was put forward in Scottish Parliament to congratulate academics and PhD students from the University of West of Scotland on educating pupils across Dumfries and Galloway on the chronic obstructive pulmonary disease (COPD). Together with Ayrshire & Arran, >3000 pupils have been engaged on BREATH to date, as featured in many of the School blogs/newsletters. • PhD students joined BREATH partners for an informative two-day visit to GlaxoSmithKline Head Office in Stevenage – to gain first-hand experience of 'Big Pharma'. • Site-specific ethics documentation was submitted to NHS Trusts in both Dumfries & Galloway, and Ayrshire & Arran, following discussions with clinical teams in both regions. • Enterprise opportunities were explored at the Chamber Business Lunch in the Easterbrook Hall, The Crichton, Dumfries. Introduced by Secretary of State for Scotland, the region was presented as 'a gem with untapped potential'; the opportunity to continue discussions with Finlay Carson MSP on BREATH progress in Dumfries & Galloway.
10	1st April 2019 - 30th June 2019	• Outreach: Volunteered as a judge in SciFest. SciFest is a Young Scientist Convention. • Manuscript with cross border authorship submitted to the journal Science • 1 Abstract accepted to the International KV7 Channel Symposium in Naples 18th June • 5 Abstracts accepted for FASEB Smooth Muscle Symposium; Florida in July SSB meeting held on 21st June. • Within QUB 2nd year students are required to submit a written progress report and attend an interview. Students are also expected to contribute to the Research Symposiums held within their respective Schools. This year a BREATH student won 3rd prize for her oral presentation at the Wellcome-Wolfson Institute of Experimental Medicine 2nd Year Research Symposium. • Finlay Carson (Member of Scottish Parliament (MSP)) supported the BREATH school's public engagement work on COPD in South West Scotland. • BREATH presented its school engagement work to date at the Dumfries & Galloway STEM Conference, The Bridge, Dumfries, leading to requested meeting Sharon Glendinning (Head of Development Crichton Campus) and Julia Macdonald (Head of Health and Social Studies, Dumfries & Galloway College).
11	1st July 2019 - 30th September 2019 (from partner progress reports)	• BREATH website had been significantly updated and revamped and the Twitter account was very active. • 10 BREATH cross border authored abstracts submitted to Irish Thoracic Society meeting in Galway, submitted September 2019 • QUB PhD shortlisted (top 3) for the QUB Postdoctoral Research Engagement Prize. • UWS PhD received the 'Outstanding Student Oral Presentation Award' from Prof Hursthouse for her recent presentation at the Society for Environmental Geochemistry and Health annual meeting - and a news piece article published in Environmental Scotland newsletter. • THE UWS BREATH team received their first-ever COPD patient sample - from Ayr hospital – possible thanks to the Ethics documentation developed and provided by Prof McGarvey (QUB). Students and staff were allowed to see a live bronchoscopy.

Table 8.3: Key Achievements		
Period	**Dates**	**Key Achievements/Points of Note**
12	1ST Oct 2019 - 31st December 2019 (from partner progress reports)	• DKIT PhD student did a 1-week secondment in QUB to gain experience in immunohistochemistry. • BREATH seminar, Professor Richard Kennedy (Almac & QUB) delivered a lecture to BREATH staff and students on the 29th of November titled "Biomarkers for precision cancer medicine". • 'Talking Heads' videos of DkIT PhD students discussing their COPD focused projects were uploaded to the BREATH website in December. • BREATH shortlisted for the QUB Vice-Chancellor's Research Culture Prize. Production of QUB BREATH video for an awards ceremony, now on the website. Attendance at the awards ceremony, 9th December 2019. • Completion of ethics and protocol optimisation to enable cell harvesting from human lung tissue under a collaborative agreement with Dr Cecilia O'Kane and Prof Danny McCauley (QUB) who obtain human lungs from organ donors, that are deemed not suitable for transplantation, but who use them for an ex vivo lung perfusion model to investigate acute lung injury. • UWS PhD student received Irish Thoracic Society runner up prize for best oral presentation at Galway 2019 meeting, awarded by Professor McGarvey. • Lead respiratory consultants in Glasgow and Edinburgh all participated in our BREATH Autumn Seminar Series of COPD.
13	1st January 2020 - 31st March 2020 (from partner progress reports)	• BREATH paper with cross border authorship published in British Journal of Pharmacology in March. • BREATH cross border and interregional paper entitled "LINGO1 is a regulatory subunit of large conductance, Ca2+-activated potassium channels" published in prestigious Proc Nat Acad Sci (USA) in January. Extensive uptake by the national press including The Independent, The Irish Mirror, Dundalk Democrat, ParkinsonsNewsToday.com and a Mid-West radio interview) of the press release associated with this paper. • Grant application on BREATH related project submitted to Irish Thoracic Society. • QUB PhD student received 1st prize for oral presentation at the 3rd year PhD Research Symposium • The BREATH first time inclusion of a COPD patient in its public awareness campaign with schools featured in the Galloway News. Martin Charters received a high level of interest from pupils during his interview on living with COPD. • Primary 5 pupils at Belmont Primary, Stranraer, are the first to be awarded the BREATH Certificate of Excellence. To mark the event, two pupils from the class, read their letters on COPD to the entire school assembly on Monday. With the support of their teaching staff, Belmont pupils have been engaged in the project, and are to be congratulated on their achievement, and the fact they have now been made official partners on the BREATH campaign. • BREATH team feature in the Dumfries & Galloway Standard for their interactive assembly at Moffat Academy on COPD and dangers of e-cigarettes. • BREATH PhD actively engaging senior biology pupils at Eastwood High to identify a lung disease prevalent in Scotland (including South and West). • Home School with BREATH Challenge Exercises - To support parents/teachers during the pandemic, the BREATH team have modified their BREATH Challenge for use as a home-schooling exercise.
14	1st April 2020 - 30th June 2020 (from partner progress reports)	• In this period (April-June) the students successfully transitioned to working from home in response to lockdown and university closure (from 18th March). During this period students drafted papers, thesis chapters and conducted literature searches to enable effective experimental planning in preparation for labs re-opening. • BREATH public engagement work featured in the Interreg VA videos section of SEUPB video feature webpage.

8.4.2 *Progress towards the Project's Output Indicators*

Table 8.4 provides a high-level summary of the progress that has been made by the BREATH project towards its Output Indicators.

Table 8.4: Extent of Achievement of Project Output Indicator Targets

Output Code	Description	Programme Target	BREATH target	Progress at July 2020[107]	Variance against project target	Commentary on progress
CO01: Productive Investment	Number of enterprises receiving support.	20	5	10	200%	Proceeding according to Work Plan. Achieved and ongoing. The BREATH project is actively engaged with three companies (ProAxsis, Prior PLM Medical and Raptor Photonics) mentioned in the application to varying degrees and has established relationships with Causeway Sensors, Mylan, Axis Bioservices, Fusion Antibodies, Norbrook, Analytical Engines and Almac Diagnostics.
CO02: Productive Investment	Number of enterprises receiving grants	10	2	0	0%	Not commenced.
CO04: Productive Investment:	Number of enterprises receiving non-financial support	20	5	10	200%	Proceeding according to Work Plan. Achieved and ongoing.
CO24: Research, Innovation:	Number of new researchers in supported entities	514	89.5	65.5	73%	Proceeding according to Work Plan.
CO26: Research, Innovation:	Number of enterprises cooperating with research institutions	10	5	8	160%	Proceeding according to Work Plan. Achieved and ongoing.
CO41: Productive Investment:	Number of enterprises participating in cross-border, transnational or interregional research projects	10	2	2	100%	Behind schedule. ProAxis and Fusion Antibodies participating in projects.
CO42: Productive Investment:	Number of research institutions participating in cross-border, transnational or interregional research projects.	5	3	3	100%	Proceeding according to Work Plan. Achieved and ongoing.

[107] Source: SEUPB's quarterly monitoring data.

8.4.3 Target Groups Reached

As of June 2019, the project partners had engaged with a variety of its intended 'target groups', as summarised below:

Table 8.5: Performance Against Target Groups Reached Targets (as of June 2019[108])

Target Groups	Description of Target Group	Target Value	Target Groups Reached
Higher education and research	Universities	3	24
Education/training centre and schools	Schools	0	21
SME	Modelling expertise	5	11
Other	1) SEUPB, healthcare professionals, academics, patient groups, charities, politicians 2) MEPs 3) Grunenthal: Pharma 4) Patient groups already existing within the regions which provide patient support.	0	14

[108] Source: Project Progress Report 10 – 'Total reported'. This was the most recently available collated project progress report.

8.4.4 *Progress towards the Project's Result Indicator Targets*

As of June 2020, the BREATH project had produced 53 peer-reviewed journal and conference publications.

Table 8.6: Progress towards the Results Indicators			
Name of Output	**Programme Target**	**BREATH Project Target**	**At June 2020[109]**
Peer-reviewed publications with cross-border authorship	75	33	53
Peer-reviewed publications with interregional authorship	Not identified	15	

8.5 Impact of COVID-19

As reflected in Section 2, key findings related to the impact of COVID-19 or otherwise on the BREATH project include the following:

- Despite the progress made (see Section 8.4), the restrictions associated with the COVID-19 meant that:
  - Project staff worked remotely during the lockdown, but no project staff were furloughed;
  - Access to laboratories was not possible during the period of lockdown (a period of circa 5 months), albeit students took the time during lockdown to write up and analyse what they had completed so far for their theses;
  - Since the lifting of some restrictions, students were able to return to the laboratory, albeit the situation is different for each Partner, as summarised below:

    - DkIT labs opened with limited access on 20th July after approval of detailed recovery plans involving reduced numbers, additional PPE, hand sanitisation measures and cleaning of the workspaces. To maintain social distancing, the BREATH researchers and the other non-breath researchers have been split into two teams. Allocation of a researcher to a Team is based on research requirements and location of the equipment to maintain social distancing, so each Team is a mixture of Breath and non-Breath students. One Team has access to the labs Monday-Wednesday and the other Friday-Saturday. In the interests of fairness, the Teams swap their days each month. There is PDRF supervision on-site on most days. Currently, one or two PIs are onsite for at least one of the days for each team. Outside of these times, PIs work from home and meet their students by Zoom. Lab meetings have also continued by Zoom, where new data acquired by each student are presented to the entire group for feedback to guide future direction. Frequent PI meetings also take place by Zoom (e.g. 2 per week). The project reports that this system is working well, and productivity has been high because of the detailed planning and high motivation of the PhD students.
    - QUB BREATH laboratories reopened on 15th June after approval of detailed recovery plans for the various buildings and laboratories which includes the wearing of PPE and shift work to minimise total numbers of researchers in buildings. Upon return to the labs, the students and post-docs have been highly motivated and productive maximising time in the lab through good planning and focussed experiments. Back to work meetings have been had with academic staff to consider any mitigating circumstances e.g. childcare, dependents, shielding, etc. Staff have been advised that they can use their discretion to balance in-work and working from home activities in line with the recommended blended approach to student engagement.
    - UWS - Writing/analysis/training webinars all advanced during the lockdown. UWS labs opened on August 17th, significantly later than the other partners. A 'booking' system has been introduced to ensure restricted occupancy limits are not exceeded, and ensure the opportunity is equally shared. Depending on lab protocol requirements, this can be 5 days a week –but more typically is 3 days per week. This has allowed all doctoral projects to recommence after the 5-month lab lockdown.

[109] Consultation with project lead (08/09/2020).

- Several online webinars and clinical seminars were organised, but these were well attended.
- The annual BREATH Conference that was due to take place in Scotland in June, but as an alternative was implemented on a virtual basis.
- The project continued to cover all of what it set out to do, with 16 BREATH PhDs and 3 matched BREATH PhDs presenting their work at PDRF chaired seminars. Additionally, TEVA provided an all-day training session as part of the online conference.
- Initially, due to changeovers in staff and staff beginning to work remotely, the project experienced a few delays in accessing documentation relating to project expenditure. These problems have now been resolved and staff are working through the claims process as best as possible to ensure the timely submission of claims.
- As travel has been restricted, expenditure associated with the travel budget has been affected. Also, the partnership reports that there will be a reduction in the Office and Administration costs claimed for across all partner institutions.

- However, discussion with the BREATH project partnership indicates that:

  - The BREATH project is mostly on track with very little risk to the project fully achieving its aims and objectives as a result of the pandemic (albeit noting that this situation might change if further periods of lockdown are implemented, which would affect student secondments).
  - Nonetheless, the project lead was of the view that it may no longer be able to deliver all of their planned activities within the original timeframe; and
  - They anticipate that they will reach their anticipated level of expenditure by the end of the anticipated project period, albeit the project will likely request a modification to some budget categories, with underspend in some categories reallocated to support extensions to some of the student projects.

- The Evaluation Team notes that discussion (during December 2020) with SEUPB's Joint Secretariat indicates that it is working closely with each of the Priority Axis 1 projects to establish the impact of the pandemic on their project and their potential requirements (e.g. project extensions). SEUPB's anticipates that it will receive formal feedback on these matters from each of the projects during early 2021.

8.6 Impact on Business and Industry

This section considers the impact of the BREATH project on business and industry within the eligible region.

As might be expected given the interim nature of the project's implementation and the continued focus in carrying out the research aspects of the project, the tangible impact of the project on business and industry (in terms of generating outputs and outcomes) can only be measured in the longer term and will be a core focus of the Evaluation Team's next tranche of research.

However, the Projects Partners are of the view that the BREATH project will significantly increase the capacity for R&I in the region by forming more than 16 new collaborations, sharing expertise in training and research and maximising the use of existing facilities.

9. CPM - CENTRE FOR PERSONALISED MEDICINE

9.1 Introduction

This section of the report considers the Centre for Personalised Medicine; Clinical Decision Making and Patient Safety (CPM) project, which was awarded grant funding under Priority Axis 1a – Enhancing Research and Innovation, Specific Objective 1.1 – Increasing business and industry-relevant research and innovation capacity across the region.

9.2 Project Overview

Personalised medicine is a research-based medical approach to guide clinical decisions to ensure a patient receives the right treatment at the right time and is now recognised as a key priority internationally. While the promises of personalised medicine are only now beginning to be realised in certain areas of cancer medicine, in particular, other disease areas have been slow to adopt or benefit from this approach, partly because of a lack of appropriate clinical engagement.

The Centre for Personalised Medicine; Clinical Decision Making and Patient Safety (CPM) project aims to create the oft-cited highly sought-after ethos and environment needed if personalised medicine is to be adapted in the partner hospitals and in five disease areas (research clusters) that have not yet engaged the personalised medicine discipline.

The 5 disease areas are associated with significant morbidity and mortality which are of national/international importance, but which pose particular challenges within the ER, especially the NW of Ireland and Western Scotland (each with their different care systems).

Each RC will carry out research to develop improved clinical care pathways leading to new products and services to address present market failures. The close proximity of two trans-jurisdictional hospital systems with a link to a third provides an ideal opportunity for research and comparative studies.

To this end, CPM's five Research Clusters (RCs) will utilise the methods and technologies from personalised medicine and apply them as follows:

RC1 Primary coronary intervention (PCI) in myocardial infarction (heart disease)
RC2 Emergency surgery
RC 3 Acute kidney injury (AKI)
RC 4 Unscheduled care in diabetes
RC 5 Diagnostic accuracy in dementia.

The five cluster areas are considered to be areas associated with significant clinical need and commercial potential and will benefit significantly from the interdisciplinary academic and commercial cross-border expertise and collaboration. On an overall basis, the project partners suggest that the project addresses 'need' on a cross-border basis by:

- Improving the research performance of academic partners across the eligible region;
- Enhancing the innovation performance of companies through academic/industry /clinical partnerships and collaborations;
- Promoting greater sharing of knowledge and expertise among partners in different healthcare systems and cross-sectorally;
- Creating a critical mass in the NW and Western Scotland which can be used internationally to recognise and build on the increasing reputation of CTRIC and the other industry/academic partners;
- Providing a platform for building further alliances to seek other prestigious EU, national and international funding.

It is anticipated that each of the 5 RCs will develop an improved clinical care pathway (incorporating the key overarching themes of a **"Conceptual Framework" - clinical care pathway redesign**,

personalised medicine **biomarkers** and **point-of-care (POC) diagnostics)**, for patients through the following steps:

a) baseline data collection;
b) data analysis to identify clinical outcome determinants [including the role of novel biomarkers], clinical care pathway redesign [including the integration of point-of-care diagnostics, decision support software] followed by;
c) prospective clinical evaluation of the redesigned care pathway; and
d) translation to a clinical and commercial utility.

It is anticipated that the CPM project will dramatically enhance regional capability while serving as a magnet for regional and FDI industry to create innovative products and new optimised care pathway tools in priority disease areas for patients and commercial benefit.

The CPM project partners consider that the major strength of the project resides in the expertise of the assembled highly complementary multidisciplinary team of clinicians, academic researchers and enterprises. In total, the project has 12 project partners, with Ulster University as Lead Partner[110]. The other partners are:

1. Western Health and Social Care Trust (WHSCT); 2. Letterkenny University Hospital (LUH), 3. Letterkenny Institute of Technology (LyIT); 4. University of Highlands and Islands (UHI); 5. NHS Highlands Scotland (NHSH); 6. Randox Laboratories Ltd (Randox),	7. United Health Group/ Optum Operations (Ireland) Limited, 8. Clinishare Ltd/Voscuris; 9. Healthcare Analytics Ltd 10. Northern Ireland Clinical Research Services (NICRS) and 11. National Universities of Ireland Galway (NUIG).

The CPM project brings together partners with the array of complementary skills necessary to deliver this complex project [Ulster – expertise in biomarkers, personalised medicine, bioinformatics, intelligent systems, commercialisation; UHI - expertise in rural health research; C-TRIC - POCT, clinical research, commercialisation; WHSCT, LUH, NHSH - clinical expertise, POCT; LyIT – computing, data analytics; commercial enterprises – expertise in biomarkers, POCT, data analytics, software design, commercialisation

Each of the partners is based on the Eligible Region except for NUIG, which has been introduced for their Health Economic and dementia-specific expertise.

The aim is to create a cross border (CB) supercluster of critical mass which will strengthen the CB economy by increasing industry-relevant HLS R&I capability particularly relating to personalised medicine.

The suggested immediate objectives of the project are to:

- Improve the triage of patients with chest pain to allow more appropriate and rapid emergency referral for PCI;
- Identify the determinants of outcomes in emergency surgery to improve care pathways and reduce morbidity and mortality;
- Earlier recognition of AKI to reduce mortality, morbidity and hospital stay;
- Improve the self-management of diabetes to reduce unscheduled care episodes and hospital admissions;
- Develop tools which will allow earlier diagnosis of dementia and therefore earlier clinical intervention and support.

[110] NB This is per the Signed Partnership Agreement (dated 12 October 2017) and not the Letter of Offer (dated 26th June 2017), which features two additional partners (Donegal Clinical Research Academy and Clinical Translational Research and Innovation Centre).

The Project Board is chaired by the Clinical Director of the CPM Project at the WHSCT and has representation from all three jurisdictions and partners, as follows:

- Representatives from Ulster including the Director of Stratified Medicine and a representative from ISRC;
- 1 each from LUH and WHSCT;
- 1 each from UHI and NHSH;
- 1 from LyIT;
- 2 industry reps, 1 each from the disciplines of diagnostics and data analytics, (with a rotational representation)

A senior clinician or academic will lead each of the five transdisciplinary RCs. The RCs will include existing staff from the partners and newly recruited staff. It is anticipated that new staff dedicated to the RCs will comprise 5 Research Director/Research Associates (RA) and 10 PhD students. Whilst each RC has its own dedicated team, they can draw upon the core project staff that will form the **"Cross Border Central Support team"**; and also, the expertise that exists within the Partners within the areas of Clinical System Design / Biomarkers / Point-of-Care diagnostics.

Eleven work packages have been developed, as follows:

Table 9.1: Summary of CPM Project Work Plans (per Progress Reports)	
1	Management
2	Biomarkers
3	Overarching Theme: Point-of-Care Testing
4	Overarching Theme: Clinical Care Pathway Redesign
5	Research Cluster 3: Acute Kidney Injury
6	Research Cluster 1: Primary Coronary Intervention (PCI) in Myocardial Infarction
7	Research Cluster 2: Emergency Surgery
8	Research Cluster 4: Unscheduled Care in Diabetes
9	Research Cluster 5: Data Analytics and Modelling for Dementia
10	IP Management/Exploitation and Commercialisation Plan
11	Communication

9.3 Project Expenditure to December 2020

The CPM project received a Letter of Offer (dated 26th June 2017) offering a grant of up to a maximum of €8,628,985.36 (ERDF + Government Match Funding) to be expended and claimed by 31st December 2021, towards total anticipated project costs of €9,424,926.67.

In April 2020, the SEUPB approved the reallocation of budget between categories, as shown in Table 9.2. As of December 2020, the project had reported total estimated expenditure of €5,095,011, equivalent to 54% of the total project budget. The original projected spend for the same period estimated that 93% of the total project budget would be incurred at this time.

Table 9.2: Project Costs – Anticipated and Estimated Actual December 2020 (€)

Summary Budget	Anticipated Total	Actual to March 2020 Per Project Progress Report[111]	Reported to JS by FLC	Pipeline Expenditure (excluding items deemed ineligible by FLC)	Total Estimated Expenditure at December 2020[112]	% of total budget
Staff Costs	4,946,911	2,037,668	2,320,043	526,381	**2,846,424**	57%
Office and Administration Costs	1,810,190	672,863	798,991	187,951	**986,942**	54%
External Expertise and Services	1,575,715	705,642	803,328	179,722	**983,050**	63%
Travel and Accommodation Costs	148,274	38,022	40,763	913	**41,677**	33%
Equipment Costs	943,837	50,686	182,240	54,678	**236,918**	25%
Total	**9,424,927**	**3,504,882**	**4,145,366**	**949,645**	**5,095,011**	**54%**
Original projected spend level[113]					**8,803,279**	**93%**

[111] Source: Project Progress Report 12 – 'Total reported'. This was the most recently available collated project progress report.
[112] Source: SEUPB's EMS 14th December 2020
[113] Source: SEUPB's EMS 14th December 2020

9.4 Contribution to the Priority's Specific Objectives and Result Indicators

This section considers the CPM project's key achievements and the extent to which the CPM project has:

- Contributed to the achievement of the Priority's Specific Objectives; and
- Contributed to the achievement of the targets for the Result Indicators.

The section also identifies any external factors that have impacted, positively or negatively, on the project's ability to contribute to the achievement of the Specific Objective.

9.4.1 Key Achievements (to June 2020)

The CPM project partners cite the project's key achievements (between January 2019 and June 2020) as being:

Table 9.3: Key Achievements

Period	Dates	Key Achievements/Points of Note
8	1st January 2019 – 31st March 2019	• Research Cluster 3: Acute Kidney Injury with the help of the research nurse had recruited n=88 CKD patients and n=38 healthy controls (Total = 136 participants). • Background IP was tabled at Management Board in February. • Data Sharing Policy drafted and shared with Partners for comments • Forecasting exercise submitted on the 14 March to SEUPB. • Organised and attended two workshops with Optum (6 and 7 March) • An SOP for the collection, transport and storage of biological samples has been developed with the Biomedical Scientist. This protocol was in use from the AKI cluster and has been circulated to the PPCI, Dementia and Emergency Surgery who will be collecting biological samples. • Diabetes Research Cluster completed 16 interviews in NHS Highland and 8 in WHSCT. • The dementia research cluster had the first journal paper accepted by the top journal in the field of Artificial Intelligence. Also, members of the dementia research cluster and Dr Magda Bucholc were selected as finalists for the UU Research Excellence Awards on dementia data analytics work. The first group of (healthy) participants have provided MEG data and blood samples.
9	1st April 2019 – 30th June 2019	• AKI PhD student 1 (Sean McCallion and research nurse have recruited 103 CKD patients and 38 healthy controls in total (n=141). PhD student has inputted relevant data from the ECR into an excel data sheet for further analysis. PhD student presented a poster at UK renal week (June) and won the best poster at the UU PhD researcher festival. PhD student completed transfer milestone. Received data for 45 plasma and 15 urine samples from Randox for AKI Research Cluster • The dementia data analytics work received the Ulster University Research Excellence Award, within the under 50 employees business category, with Nightingale Analytics. MRI and MEG scans have started for the dementia research cluster. The RA developed a highly novel method to analyse MEG data in a very high-resolution format without sacrificing computational cost. 2 posters and 1 oral presentation were made at the Alzheimer's Association International Conference. • Emergency Surgery RC team collected data related to the MDS and additional modules for approximately 1400 patients. The 3 papers accepted for publication. • Cardiovascular RC submitted 3 papers to a peer-reviewed journal. • Care Pathways team resubmitted paper to a peer-reviewed journal.

Table 9.3: Key Achievements		
Period	**Dates**	**Key Achievements/Points of Note**
10	1st July 2019 – 30th September 2019	• ICD-10 disease codes captured in the Redcap system (LYIT), with the aim of recording standardised definitions of comorbid diseases. • AKI RC recruited 131 CKD patients, 38 healthy controls and 31 AKI patients. Next batch of blood samples due to be sent to Randox in October. Potential IP identified from sample analysis. Invention disclosure form submitted, and the patent process started with UU IP team. • 6 papers accepted for publication this quarter. • The emergency surgery RC had approx. 2000 patients on the patient registry at the end of October • MRI and MEG scans are almost complete for the dementia control group. The dementia research cluster made six presentations at conferences. • TMED conference with over 200 attendees. CPM project submitted 13 posters and staff chaired 4 sessions at the TMED. Two of the CPM research associates were selected for a special presentation at the event. One of the top executives of Optum provided the keynote address at the CPM session.
11	1st October 2019 – 31st December 2019	• eZine issue 4 focussing on acute kidney injury published Nov 2019 • The Emergency Surgery Research Cluster issued a media release on the 25th October and possessed data on approx. 2645 patients. • PPI training workshop held on the 8 November. Attended by 26 staff/students of CPM. • AKI research cluster has recruited 152 CKD patients, 38 healthy controls and 42 AKI patients. AKI research cluster started data collection in LUH which will increase patient recruitment substantially. Another batch of samples was sent to Randox for analysis. • Full ethical permission received, and a systematic review has been accepted for publication for the Cardio Biomarker project. Completed digital form usability testing by Altnagelvin nurses.
12	1st January 2020 – 31st March 2020	• Biomarkers:AKI: 232 patients recruited and 28 follow-ups. Wet lab experiments were developed to validate up and downstream targets of prognostic markers identified from the first Randox panel's analysis. • PoC Testing: 3 papers submitted to the conference • Cardiology: Submitted 3 abstracts to ISCE conference,5 papers underway and 2 under review and Emergency Surgery. • Diabetes:1 paper under review and In-hospital study started • Dementia: Recruitment of controls completed, Clinical Care Pathways and KPIs for baseline care pathways were mapped where there are ones in place.
13	1st April 2020 – 30th June 2020 (from partner progress reports)	<u>UU</u> • UU sought to identify the impact of COVID 19 and develop contingency plans to reduce any impact with individual researchers and with team meetings. • A management team meeting was held on the 14 May aimed specifically at COVID impact and contingency plans • eZine released in April focussing on the Emergency Surgery research cluster • Cardiology research cluster continued producing papers and revised ethics to include all PhD students to extend study using the new digital triage form. • Diabetes RC submitted 1 paper and had three in preparation • Several papers were published and submitted to conferences <u>WHSCT</u> • Quality error rates in POC and determinants of quality were studied for a range of POC tests using data both from Altnagelvin Hospital and LUH were extracted and analysed with a paper being prepared. • Research ethics submitted for review of a study on patient self-management and quality of life on the cholecystectomy waiting list at Altnagelvin hospital. Also assisted in the submission of ethics for a PhD student project, on the study of diagnostic practice and pathways in cholecystitis; the first application is linked to the second. • Identification and recruitment of patients for AKI and cardio work packages and associated data were identified and recruited. • Work progressed across Altnagelvin to enable the feasibility trial of Flash Glucose Monitoring to commence. • Papers submitted for conference presentations and publications for point of care testing.

Table 9.3: Key Achievements		
Period	**Dates**	**Key Achievements/Points of Note**
		LUH9 **Emergency Surgery Research Cluster:** • COVID-19 was considered to have had a significant effect on EGS data collection throughout period 13. Two clinical research nurses were re-deployed to clinical duties, causing data collection to cease from mid-March. However, the two nurses commenced clearing the data collection back-log at the beginning of May. • Interviews for the post of Research Nurse for Emergency Surgery Performance Safety & Personalised Outcomes (1.0 FTE) were advertised. **Diabetes Research Cluster**: • The COVID-19 pandemic has caused a delay in research. • Interviews for the post of Research Nurse for Diabetes & AKI (0.5 FTE) were advertised via LYIT. **Cardiovascular Research Cluster:** • COVID and non-COVID pathways had to be implemented. LYIT • The Emergency Surgery cluster (RC2) suspended their research activities, as all health staff were required to work in LUH. They restarted collecting data for research purposes and there was a backlog of work that the Emergency Surgery cluster had to get through. LYIT assisted one of the research nurses in getting access to the system from home. • Zoom meetings were held with the Diabetes cluster and the CPM Central Technology Team to discuss progress, and how to cope during the Covid-19 restrictions. As a result, daily work was carried out on retrieving, scraping, and preparing the Republic of Ireland Covid-19 data. This data was then sent on to the CPM data analyst, and used in the UU COVID Tracker App. UHI • Charlie Kneory was redirected to clinical work but continued to work on his PhD in his own time and a paper was accepted for publication • Work progressed across the 3 sites to enable the feasibility trial of Flash Glucose Monitoring to commence and the documents for ethical approval were finalised. • Two systematic reviews were submitted for review. One journal requested paper to be revised and resubmitted. The other paper was rejected and was revised in the light of feedback and resubmitted to another journal. • Qualitative paper based on preliminary interviews with patients admitted for unscheduled care was submitted to Journal of Health and Social Care in the Community but was unsuccessful and was to be revised). NHS H • Coronary Intervention: The projects continued as planned until the Covid 19 pandemic at which point sample collections which had been successfully established ceased. Progress following this focused on the writing of papers and thesis chapters. Voscuris • Questionnaire functionality within the Voscuris android app underwent internal evaluation and testing which identified several fixes and improvements to be implemented. • The Voscuris team reviewed project resourcing needs and availability. Based on this assessment a request was submitted to amend the percentage of time budgeted for each team member. NUIG • RC5: Dementia/ Alzheimer's Disease Research Cluster - Professor Gillespie met with Kongfatt Wong Lin. This project led to a collaboration on a paper led by Kongfatt Wong Lin. • Prof. David Finn contributed to WP T8 RC 5: Data Analytics and Modelling for Dementia Diagnosis. He assisted with the training of two PhD students within the cluster, reviewed and co-authored abstracts, presentations and draft manuscripts.

9.4.2 *Progress towards the Project's Output Indicators*

Table 9.4 provides a high-level summary of the progress that has been made by the CPM project towards its Output Indicators.

Table 9.4: Extent of Achievement of Project Output Indicators Targets

Output Code	Description		Programme Target	CPM Target	Progress (as of September 2020[114])	Variance against target
CO01	Number of enterprises receiving support		20	5	4	80%
CO02	Number of enterprises receiving grants		10	3	3	100%
CO04	Number of enterprises receiving non-financial support		20	5	4	80%
CO24	Number of new researchers in supported entities	T1.4.1		10.40		
		T2.1.1		3.70		
		T3.1.1		5.90		
		T4.1.1		9.90		
		T5.1.1		10.00		
		T6.1.1		16.90		
		T7.1.1		10.00		
		T8.1.1		10.30		
		T9.1.1		3.09		
			514	**80.19**	**54.24**	**68%**
CO26	Number of enterprises cooperating with research institutions		10	5	5	100%
CO41	Number of enterprises participating in cross border, transnational or interregional research projects		10	5	5	100%
CO42	Number of research institutions participating in cross border, transnational or interregional research projects		5	4	4	100%

[114] Source: SEUPB's quarterly monitoring data.

9.4.3 Progress towards the Project's Result Indicator Targets

It was anticipated that the CPM project would:

- Produce 13 peer-reviewed REF standard journal publications in the H&LS Sciences field with cross border authorship; and
- 30 other high-quality peer-reviewed publications, (abstracts, attendance and presentation of the CPM research findings at named conferences). During consultation, the Lead Project Partner confirmed that it is assuming that these publications will also need to be cross-border in nature (albeit noting that this is not stipulated within its LoO). It is understood that the Project's Partners are seeking clarification from SEUPB on this matter.

As at August 2020[115], 7 peer-reviewed REF[116] standard journal publications and 36 other high-quality peer-reviewed publications have been produced in the H&LS Sciences field with cross border authorship.

9.4.4 Progress towards the Project's wider specific objectives

The CPM Project Partners note the following concerning the progress made towards to project's stated objectives:

Table 9.5: Project Specific Objectives (at March 2020[117])

Project Specific Objectives	Level of Achievement	Explanation
1. To establish a 'Centre for Personalised Medicine; Clinical Decision Making and Patient Safety (CPM)	To a large degree	The Centre has been established with 12 partners.
2. By 1st April 2017, to establish 5 research clusters (RCs)	To a large degree	Each of the 5 research clusters was established and all new staff were in place.
3. By 1st April 2017, to commence work plans with all selected existing staff allocated to the project	To a large degree	All work plans had commenced with the majority of the selected existing staff allocated to the project. Where the original existing staff had not taken part in the project, they were replaced by other staff in partner organisations (on SEUPB approval)

9.5 Impact of COVID-19

As reflected in Section 2, key findings related to the impact of COVID-19 or otherwise on the CPM project include the following:

- Despite the progress made (see Section 9.4), the restrictions associated with the COVID-19 meant that:
  - Various staff across the lead partner's organisation, project partners or direct beneficiaries started working remotely or were furloughed during this period.
  - All patient recruitment had to be suspended in March, for the foreseeable future;
  - There is also additional work required on samples already collected to ensure that they have not been impacted by COVID. Therefore, deliverables relating to the 'Pathway to Impact' may be negatively impacted.

[115] Source: Consultation with project lead (21/08/2020).
[116] Research Excellence Framework. The REF is the system for assessing the quality of research in UK higher education institutions.
[117] Source: Project Progress Report 12 – 'Total reported'. This was the most recently available collated project progress report.

- The project's deliverables, in most cases, are dependent on the outcome of the research clusters. However, at the current time, it is difficult to predict the outcome of the research clusters and therefore the extent to which 'pathway to impact' deliverables will be achieved. This applies also to re-designed care pathways as again given the impact of COVID on care pathways generally and the lack of patient recruitment, the extent to which redesigned care pathways as originally envisaged may be affected cannot yet be ascertained.
- Some activities were refocused to support efforts to curtail COVID-19. For example, under the Biomarker, Acute Kidney and Point of Care Testing Work Packages, Coral Lapsley (Research Associate, Biomarkers WP), David Porter (Research Associate, PoC Testing WP) and Andrew English (Research Associate, Acute Kidney WP) completed training on lab equipment (ELISA) at C-TRIC CATII labs and began working in the lab. The purpose of this work was to test plasma samples already collected by the Trusts for SARS-CoV-2-reactive antibodies. They then analysed SARS-CoV-2- antibodies in blood samples to estimate the seroprevalence of COVID-19 in Trusts. This is a Northern Ireland specific seroprevalence study to help define previous exposure. As the CPM project involves the recruitment of patients in the WHSCT, this study will allow for the determination of exposure across NI and specifically the WHSCT which is of vital importance for data already collected and any data that may be collected in the future.
- In some situations, there was an increased workload for researchers as the pandemic is relevant to the project. Also, a doctor doing a PhD had to be redirected away from the CPM project to clinical work;
- Two particular contributions of CPM staff to the COVID effort at a national level are noted below and align with the work of the CPM generally:

    - Ben Wingfield (Research Associate Data Analytics) has collaborated with Professor Colum Walsh (UU) and Dr Sara-Jayne Thursby (UU) to develop a pilot contact tracing system for the Public Health Agency (PHA). The system was demonstrated to Jackie Hyland (a consultant in health protection) at the PHA and they are now trialling the system on their infrastructure. Ben is currently providing technical advice regarding setting up the infrastructure to the PHA and working to tailor the system for bespoke Northern Ireland mapping and reporting application. For example, plotting spot maps of confirmed COVID-19 outbreaks in NI, including data such as care home locations and NHS trust boundaries.
    - Magda Bucholc (UU) and Matthew Manktelow (UU) are assisting with the COVID Dashboard for Northern Ireland, which provides a breakdown of COVID deaths, cases etc. daily. They are working closely with the Department of Health and Magda sits on the Modelling Group at Department level. Matthew will work with Kevin Blake (LYIT) to see if similar data can be got from RoI for comparability across regions.

- Consequently, discussion with the CPM project partnership indicates that:

    - The project is behind schedule and there is now a risk that it will not achieve its aims and objectives;
    - The project may no longer be able to deliver all of their planned activities within the original timeframe
    - Most of the planned activities can still be delivered but some may not be due to patient recruitment being delayed, events being rearranged virtually or cancelled, and the possible need for an extension in the timeframe due to the delay in staff starting and the requirement for additional personnel;
    - However, it is feasible to make up for the delays to the project if an extension is provided;
    - The partnership advises that they have requested a project extension from SEUPB, which they anticipate might be covered by an underspend in the salary budget. The partnership does not anticipate needing any further monies beyond that which was allocated in the original budget.

- The Evaluation Team notes that discussion (during December 2020) with SEUPB's Joint Secretariat indicates that it is working closely with each of the Priority Axis 1 projects to establish the impact of the pandemic on their project and their potential requirements (e.g. project extensions). SEUPB's

anticipates that it will receive formal feedback on these matters from each of the projects during early 2021. The Joint Secretariat's discussions with the CPM project partnership indicate that:

- At November 2020, the project's estimate for PhD years out was 72.09 years (against a target output of 80.19). However, the project has requested approval for additional staff to help address COVID research on the project which will help achieve the target.
- Two enterprises (HCA and NICRS) had furloughed staff and were not expected to claim for Period 13 (April – June 2020).
- Other enterprises (such as Optum) have been too busy with COVID activities to submit a claim. This will affect financial contributions to CPM.
- Randox has been unable to submit costs for blood analysis for AKI RC. Due to the number of samples being collected and the likelihood of sufficient samples not being collected, it may not be efficient to put the analysers (equipment) into the partner organisations as originally thought. This will affect financial contributions to CPM. At the time of writing, SEUPB was discussing this with the CPM project.
- Currently, there is not expected to be any detrimental impact on the anticipated13 REF standard cross-border, peer-reviewed publications and 30 other publications
- There is a risk that the participant companies will no longer be able to contribute the cash contribution as set out in the Letter of Offer
- Some enterprise partners had furloughed staff. However, their engagement is now progressing again.
- The project has submitted a change request which outlines the changes to the way research is conducted on the project. The project partners are now involved in SERCOMNI and COVRES initiatives in addressing COVID.
- All clinical staff had returned to project work except for one staff member who was expected back on CPM in September.
- The project will seek a 6-month extension, as there has been an impact on the project's ability to collate clinical data which affects all research clusters.

9.6 Impact on Business and Industry

This section considers the impact of the CPM project on business and industry within the eligible region.

As might be expected given the interim nature of the project's implementation and the continued focus in carrying out the research aspects of the project, the tangible impact of the project on business and industry (in terms of generating outputs and outcomes) can only be measured in the longer term and will be a core focus of the Evaluation Team's next tranche of research.

10. CO-INNOVATE – THE INNOVATION PATHWAY PROGRAMME

10.1 Introduction

This section of the report considers the Co-Innovate programme, which was awarded grant funding under Priority Axis 1b – Promoting Business Investment in Research and Innovation, Specific Objective 1.2 – Increasing the number and capacity of SMEs engaged in cross-border research and innovation activity in the region aimed at the development of new products, processes and tradable services.

10.2 Project Overview

Objective 1.2 of the Cooperation Programme sets out the need to increase the number of innovation-active SMEs in the eligible region, to assess and improve their capacity, and to address the barriers to innovation, by increasing cross-border collaboration with other innovation actors.

InterTradeIreland's (one of the Co-Innovate project partners) own research suggests that the key constraints on SME innovation are capability deficiencies in firms and the challenge of managing connectivity to the broader R&I ecosystem. Their research[118] indicates that SMEs across the region, particularly smaller ones, tend to draw on their own resources when innovating, and when they adopt a more open approach, they tend to do so in a narrow fashion, engaging mainly with customers and suppliers, rather than with research institutions or other factors.

To help alleviate such issues, the Co-Innovate Programme aims to facilitate and support cross-border connectivity between enterprises and research institutes. The Programme brings together, for the first time. key development agencies within Ireland, Northern Ireland and Scotland to deliver a comprehensive cross-border SME innovation capability development programme. The lead partner, InterTradeIreland, has a unique track record in designing, developing, delivering, monitoring and evaluating effective and efficient cross-border R&I programmes for SMEs. The other partners are:

- Scottish Enterprise and Highlands and Islands Enterprise, Scotland's economic development agencies;
- Enterprise Northern Ireland (Enterprise NI), the representative body for the local enterprise agency (LEA) network in Northern Ireland;
- The Local Enterprise Offices (LEOs) in the border counties of Ireland; and
- East Border Region Ltd (EBR), who brings experience in the financial management of EU-funded programmes.

The programme aims to increase the proportion of SMEs engaged in cross-border research and innovation (R&I) collaboration within the eligible region, from 22% (2014) to 33% (2023). It intends to engage with over 1,408 SMEs, providing them with education, capability development and support according to need and absorptive capacity.

Using its knowledge and experience of developing innovation capabilities and collaborative opportunities for SMEs, the Co-Innovate project partnership has developed an integrated programme that includes:

- Workshops delivered by innovation experts familiar with the challenges facing SMEs;
- R&I capability assessments tailored for SMEs;
- Enterprise-specific action plans designed to develop R&I capabilities;
- Intensive mentoring to address specific challenges;
- Active engagement in cross-border R&I partnerships; and
- Sector-specific networks involving enterprises and research institutes.

[118] InterTradeIreland, Leveraging the Innovation Ecosystem for Business Advantage: A Cross-Border Study, December 2012

The project partners consider that the Co-Innovate Programme will be unique in that it will provide an integrated pathway to address capability deficiencies through audit-based mentoring and advice before facilitating new cross-border connections.

It is anticipated that the programme will help SMEs identify and understand the barriers that constrain their innovation activity and thus limit their growth potential. The programme will work with the firms to identify their capability deficiencies and point them to the most appropriate supports – which may be other elements in the Co-Innovate Programme or other supports available in their region to improve their innovation capability. The project partners consider that the programme, therefore, represents a holistic and comprehensive approach, coordinating with and mobilising existing R&I supports across the entire eligible region, to progress SMEs with identified growth potential from being relatively innovation-inactive to full participation in collaborative cross-border R&I partnerships and networks. In relation to this aspect, both Enterprise Ireland and Invest NI have agreed to establish an Advisory Board to ensure that enterprises are directed to the most relevant supports available and to avoid duplication. In Scotland, Highland and Islands Enterprise and Scottish Enterprise are the Scottish Government's agencies with responsibility for delivering business support, including all R&I supports, to SMEs. These agencies are also represented on the Advisory Board to ensure a coordinated approach that aligns the Co-Innovate Programme with existing supports.

It is anticipated that SMEs participating in the Co-Innovate Programme will[119]:

- Promote and stimulate a culture of R&I;
- Inject and embed sustainable innovation management practices;
- Create positive changes in market growth, jobs, wealth creation, investment in product development, and new products, processes and services;
- Invest more in human capital, leading to improved skills, productivity, performance, recruitment, staff retention and reduced absenteeism;
- Share knowledge and experience in R&I with other SMEs and with educational and research institutions;
- Promote open innovation and improve access to the innovation ecosystem across the eligible area;
- Avail of cross-border and inter-regional collaboration opportunities;
- Improve their capacity for sustainable development.

Ultimately, the project partners suggest that enterprises completing the programme will develop new products, processes and services and improve their growth trajectory.

It is anticipated that the Co-Innovate Programme will focus on SMEs from manufacturing and tradable services, with specific priority afforded to enterprises from the Renewables, Life and Health Sciences and Agri-food sectors.

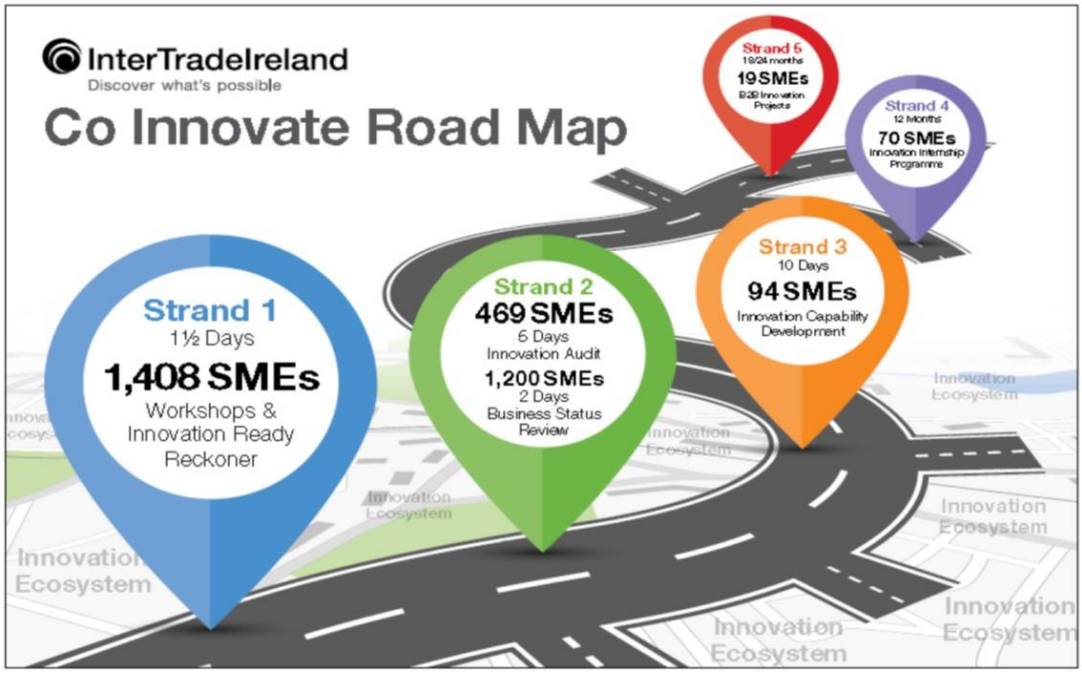
The project will be delivered in five strands, as illustrated in Table 10.1 and Figure 10.1.

Table 10.1: Overview of the Co-Innovate Programme

Strand	Expected Result
1. Innovation Ready Reckoner and Workshops	Greater awareness of the need for R&I in business and of ways to develop R&I capability
2. Business Status Review and Innovation Audit	Participant SMEs have a thorough understanding of their R&I position, and a clear action plan to achieve their aims and objectives
3. Innovation Capability Development Programme	Enhanced innovation absorptive capacity for SMEs.
4. Cross-Border Innovation Internship Programme	Jobs created, investment in human capital and the development of new products and processes
5. R&I Partnerships	Increased performance, capability and profit for SMEs; innovation networks

[119] NB the project partners have advised that they will tracking and recording each of these desired benefits through the implementation of a comprehensive Benefits Realisation Plan. In addition, Where appropriate participants will be asked to identify and quantify any increase/decrease in turnover, export sales, employment levels, business confidence, and level of R&I activities.

Figure 10.1: Co-Innovate Programme Strands



Ultimately, the project partners anticipate that the programme will create a unique cross-border innovation ecosystem and produce long-term benefits by establishing new contacts, sharing expertise and experiences, and developing solutions to common issues, leading to increased collaboration on R&I, across the entire region.

Seven work plans have been developed.

Table 10.2: Summary of Co-Innovate Project Work Plans (Per Progress Reports)	
1	Management
2	Strand 1 – Preparatory Interventions delivered via Workshop
3	Strand 2 – Preparatory Interventions delivered on a one-to-one basis
4	Strand 3 – Innovation Capability Development Programme
5	Strand 4 – Cross-Border Innovation Programme
6	Strand 5 – Cross-Border R&I projects
7	Communication

10.3 Project Expenditure to December 2020

The Co-Innovate project received a Letter of Offer (dated 21st June 2017) offering a grant of up to a maximum of €16,671,743.79 (ERDF + Government Match Funding) to be expended and claimed by 31st March 2022, towards total anticipated project costs of €22,443,035.35.

In March 2020, the SEUPB approved a 6-month project extension, to 30th September 2022 and the reallocation of budget between categories, as shown in Table 10.3. As of December 2020, the project had reported total estimated expenditure of €6,652,979, equivalent to 30% of the total project budget. The original projected spend for the same period estimated that 87% of the total project budget would be incurred at this time.

Table 10.3: Project Costs – Anticipated and Estimated Actual December 2020 (€)

Summary Budget	Anticipated Total	Actual to January 2020 Per Project Progress Report[120]	Reported to JS by FLC	Pipeline Expenditure (excluding items deemed ineligible by FLC)	Total Estimated Expenditure at December 2020[121]	% of total budget
Staff Costs	4,201,771	2,180,986	2,180,986	373,192	**2,554,178**	63%
Office and Administration Costs	630,266	327,140	327,140	55,978	**383,118**	63%
External Expertise and Services	16,918,179	2,309,294	2,309,294	521,459	**2,830,753**	19%
Travel and Accommodation Costs	556,152	133,131	133,131	6,890	**140,021**	36%
Equipment Costs	136,668	68,112	68,112	17,066	**85,179**	87%
Total	**22,443,035**	**5,018,663**	**5,018,663**	**1,634,316**	**6,652,979**	**30%**
Original projected spend level[122]					**19,503,081**	**87%**

[120] Source: Project Progress Report 14 – 'Total reported'. This was the most recently available collated project progress report.
[121] Source: SEUPB's EMS 14th December 2020
[122] Source: SEUPB's EMS 14th December 2020

10.4 Contribution to the Priority's Specific Objectives and Result Indicators

This section considers the Co-Innovate project's key achievements and the extent to which the Co-Innovate project has:

- Contributed to the achievement of the Priority's Specific Objectives; and
- Contributed to the achievement of the targets for the Result Indicators.

The section also identifies any external factors that have impacted, positively or negatively, on the project's ability to contribute to the achievement of the Specific Objective.

10.4.1 Key Achievements

The Co-Innovate project is on course to meet and in some cases exceed the targets established for Strands 1-3 and 5. The challenge continues to be the full achievement under Strand 4. The project has received a 6-month extension and this will support ongoing effort to deliver Strands 4 and 5.

The Co-Innovate project has experienced several challenges as a result of COVID-19. Several businesses have needed to close down their operations for some time. This has meant that some of the interventions have been paused and whilst these have now resumed, timelines have been impacted. Also, 5 firms under Strand 4 have withdrawn due to the impact of COVID-19 on their business.

One area of achievement under Strand 5 relating to COVID-19 has been the group of 18 firms that has come together to set up a not-for-profit company, Hero Shield Ltd, to manufacture low-cost quality face visors for health workers with help from €300,000 of funding from the programme. The partners which had never produced face shields before, include Northern Ireland companies Shnuggle Ltd, Crossen Engineering, Denroy Plastics, Miniprint and Ad-Vance Engineering, with support from the Queen's University of Belfast. The Irish cohort of the partnership includes Xtru Pak in Cavan and Glen Dimplex in Dublin. They have collectively worked to repurpose their manufacturing facilities and supply chains. There has been an overwhelming response from the health sector both north and south, with orders recently placed for 70,000 visors per week.

Adam Murphy, CEO of Shnuggle Ltd, shared his reflections:

"Hero Shield was born when we heard about the desperate need for PPE. We saw an opportunity to use our collective skills and knowledge of precision engineering, plastics and manufacturing to create a low-cost, fast-manufacture face shield. We wanted these to be distributed free of charge or at cost. We will sell some product at a small profit to private companies, which will raise funds to make even more Hero Shields, allowing us to continue operating as a not-for-profit company. Funding from Co-Innovate has provided us with financial support to keep this amazing venture running for the benefit of all in society."

Key achievements (at September 2020[123]) by project strand are discussed below:

Strand 1

At the end of September 2020, the Co-Innovate project partners workshops had been attended by 1,406 SMEs, as follows:

Table 10.4: Progress under Strand 1					
Strand 1	**Northern Ireland**	**Ireland**	**Scottish Enterprise (SE)**	**Highlands & Islands Enterprise (HIE)**	**Total**
Target	696	360	176	176	1408
Actual (to Sept 2020)	688	365	175	178	1,406
Difference	**-8**	**+5**	**-1**	**+2**	**-2**

The table illustrates that the project partners have recruited 99% of the overall anticipated workshop attendees, which should be viewed positively considering project partners in Ireland and the Scottish Enterprise region had to put workshops on hold at the outset of the COVID-19 pandemic. Co-Innovate indicated that they were confident of a quick completion on this strand due to the low level of numbers outstanding, and most businesses already having progressed to Strand 2.

Strand 2 - Targets

At the end of September 2020:

- 922 businesses had completed a Business Status Review;
- 338 businesses had completed an Innovation Audit; and
- 75 Business Status Reviews and 46 Innovation Audits were in progress.

Table 10.5: Progress under Strand 2								
Strand 2	**Northern Ireland**		**Ireland**		**Scottish Enterprise**		**Highlands & Islands Enterprise**	
	BSR	**IA**	**BSR**	**IA**	**BSR**	**IA**	**BSR**	**IA**
Target	595	232	306	119	150	59	150	59
Actual Completed to Sept 2020	480	174	268	93	116	28	58	43
Difference	**-115**	**-58**	**-38**	**-26**	**-34**	**-31**	**-92**	**-16**
BSRs/IAs currently in progress	26	16	21	14	8	11	20	5
Total Completed + in progress	506	190	289	107	124	39	68	48

Discussion with Co-Innovate highlighted the following concerning Strand 2:

- As a result of the regulations imposed by the COVID-19 restrictions, BSR and IA could not be delivered face to face with companies at their premises or elsewhere. Delivery consultants (in Ireland) and Programme Managers in Scotland were advised to deliver the assessments via telephone and online conferencing facilities where possible and appropriate. However, it was stated that some companies had proven difficult to contact.
- Also, in many cases, COVID-19 had a negative impact on the Programme's ability to deliver the progress in Strand 2 as planned, with many businesses prioritising other matters (e.g. business survival) or having their premises/business on lockdown or staff furloughed, and thus staff were not available to conduct support with.

[123] Source: Consultation with Co-Innovate (22/10/2020).

- To address the disparity between Strand 1 places left to recruit, which in themselves will not be enough to address the shortfall in BSR numbers, Co-Innovate has now provided the option for businesses to go directly to BSR without going through Strand 1.
- Whilst the original timeframes were to achieve the targets by September 2020, Strand 2 is circa 5 months behind schedule as a result of the restrictions and impacts on businesses activities associated with the COVID-19 pandemic. However, the Co-Innovate Team are of the view that they have ample time in the programme to achieve the targets and aim to complete Strand 2 by Q3 2021.

Given the ongoing and recent tightening of COVID-19 restrictions[124], the Evaluation Team is of the view that there are uncertainty and risk that the targets will not be achieved.

Strand 3 - Targets

At the end of September 2020, 91 businesses were approved for Strand 3 support, against the final target of 94. Of the 91 businesses, 64 had completed their participation in Strand 3.

Table 10.6: Progress under Strand 3					
Strand 3	**SMEs completing the Capability Development Programme**				
	Northern Ireland	**Ireland**	**Scottish Enterprise**	**HIE**	**Total**
Target	46	24	12	12	**94**
Actual approved to Sept 2020	49	23	8	11	**91**
Actual completed to Sept 2020	37	14	6	7	**64**
Difference (approved)	**+3**	**-1**	**-4**	**-1**	**-3**

Discussion with Co-Innovate highlighted the following concerning Strand 3:

- Similar to Strand 2, the regulations imposed by the COVID-19 restrictions, have affected the project partners' ability to deliver Strand 3 capability development activity, whereby they cannot continue to deliver the face to face activity with businesses at their premises or elsewhere. Delivery consultants were advised to deliver the assessments via telephone and online conferencing facilities where possible and appropriate.
- It is understood that SEUPB agreed (in August 2020) to allow Co-Innovate to offer more Strand 3 support by halving the number of mentoring days available from 10 to 5 days to increase the demand for Strand 2 and feed into Strand 4 as detailed in Table 10.7. However, Strand 3 was ahead of schedule and has a pipeline of potential SMEs and therefore do not envisage any issue with achieving the full target numbers at this time. Nonetheless, this should continue to be monitored and assessed as COVID-related restrictions develop.

[124] For example, a four-week "circuit breaker" lockdown came into force in Northern Ireland on Friday 16th of October in an attempt to stall the rise in coronavirus cases. On Wednesday 21st October 2020, the Republic of Ireland introduced Level 5 restrictions across the country for a period of 6 weeks.

Table 10.7: Strand 3 Proposals and SEUPB Response					
	Co-Innovate Proposals/Ideas	**Initial Outcome**	**SEUPB Response**	**Co-Innovate Feedback**	**SEUPB Final Determination (August 2020)**
1	This Strand 3 proposal has 2 objectives: - Increase the desire to complete the Innovation Audit by making more Strand 3 support available, especially as there are limited Strand 3 places available. The risk is if the Strand 3 requirement has all been allocated then there is less incentive on offer for businesses to complete Innovation Audits and thus make the Strand 2 Output target difficult to complete. - Increase the feed to Strand 4 by splitting the 10 days in Strand 3 into 5 days and offering to twice as many businesses from those numbers outstanding.	Rejected previously by SEUPB Co-Innovate: ITI requested that this be reviewed by SEUPB due to Covid now being an issue.	This was part of the original additional funding bid to have more strand 3 project activity, which was subsequently withdrawn. Will this dilute the strand 4 projects significantly? Do you have any evidence that 5 days under strand 3 would work? Does the project have underspend it could use for additional strand 3 and retain the original strand 4 days? SEUPB are agreeable with some additional strand 3 as originally outlined within reason. Please can you provide details of how many projects it would be?	This will not dilute the Strand 4 activity as it is a separate support entity and many companies undertake innovation capability development that has aspects not related to the Strand 4 project. The feeling of the Co-Innovate partners is that this will enhance the Strand 4 projects as we increase our pipeline of potential projects to review, and can therefore approve the higher quality opportunities. The programme does not have any additional funds available at this point to conduct additional Strand 3 activity above the original targets as it has committed budget to cover the 6-month extension period. The proposal does not require any additional funding to implement, as we still offer the same number of mentoring days in totality. Splitting of mentoring days at this point would only be possible for a small number of SMEs as of the 94 target, there is 1 space available in RoI, 4 in SE and 4 in HIE at this time. NI has already hit its target. As this support will become unavailable soon as it meets the total target, and Strand 4 & 5 projects have a higher approval threshold, engaging in Strand 2 becomes less attractive for businesses as they may not	SEUPB are agreeable with some additional strand 3 as originally outlined with prior agreement to the number of SMEs.

Table 10.7: Strand 3 Proposals and SEUPB Response					
	Co-Innovate Proposals/Ideas	**Initial Outcome**	**SEUPB Response**	**Co-Innovate Feedback**	**SEUPB Final Determination (August 2020)**
				receive the more significant support in the latter strands for the significant time they give to complete the BSR and IA. A few more mentoring days created by splitting the current 10 days, would be seen as an attractive reason to complete Strand 2 for many SMEs while allowing Co-Innovate to be of significant benefit to companies with highly relevant support at this time.	
2	As per the PMC meeting in May 2020, SEUPB to allow the Co-Innovate partners to allocate some Strand 3 mentoring to companies who do not have a high potential Strand 4 or 5 project. This requirement restricts who this support could be provided to, and at a time now more than ever due to Covid there are businesses who this would be highly beneficial innovation capability development for and who could benefit from this without having to partake in a project, and the associated financial and resource commitments this entails at a time when business survival is a priority for many.	For consideration	This is agreed to meet the strand 3 target numbers and support business during this time of COVID. SEUPB are now concerned that is using strand 3 days to support companies that do not have a high potential could impact on the projects ability to deliver under strand 4. Grateful for your comments around this.	At this time Co-Innovate is finding the majority of the applicants and in turn, approved projects for Strand 4 and 5 have come from "direct to" recruitment for the projects. It is felt this will continue to be the most productive project recruitment method going forward, especially as the more significant opportunities with SMEs within the programme are already being managed. As mentioned in point #1 above, there are only 9 spaces available for Strand 3 before meeting the final target, so this will not significantly impact the pipeline for projects. However, at this time of company survival and recovery planning, this Strand 3 support is highly relevant and could make a significant difference to the continued existence of some companies who could not undertake a project at this time.	This is agreed to meet the strand 3 target numbers and support business during this time of COVID.

Strand 4 - Targets

At September 2020, 37 businesses had been approved for support under Strand 4. However, as a result of the COVID-19 pandemic, 8 businesses have expressed a desire to place their project on hold. In addition to the 37 businesses, a further 5 businesses were approved to start but have since withdrawn due to the impact of COVID-19 on their business.

Table 10.8: Progress under Strand 4					
Strand 4	**Innovation graduates placed in SMEs**				
	Northern Ireland	**Ireland**	**Scottish Enterprise**	**HIE**	**Total**
Target	27	26	9	8	70
Projects Approved to Start by Sept 2020	19	14	4	0	37
Approved projects which have expressed the wish to go on-hold	4	4	0	0	8
Difference	**-8**	**-12**	**-5**	**-8**	**-33**

Discussion with Co-Innovate highlighted the following concerning Strand 4:

- Strand 4 is proving to be the most challenging area of the Co-Innovate Programme. Before the onset of the COVID-19 pandemic, the partners had forecasted progress in December 2019 which outlined that the partners required an extension of 9 months to achieve the anticipated output target of 70 projects completed. However, the project partners are of the view that the approval in March 2020 of only 6 months' extension means that the programme will most likely not achieve this target as it reduced the required delivery months requested by 3 months. It is understood that a condition of the 6-month review was for an immediate review of the existing Strand 4 and 5 model/approach was to be completed.

- Covid-19 restrictions have negatively impacted the delivery of Strand 4 since March 2020 and continue to do so as regulations have not yet eased fully. The unforeseen negative impacts of the Covid-19 pandemic on the Programme's ability to deliver the output targets for Strand 4 include:

  - Many business premises closed for a significant period and were inaccessible for the project work to occur onsite. Remote access to files etc. was also not readily available or possible for many - their systems and processes were not established to operate in that manner.
  - Academic Institutes were closed for some time and were inaccessible for the project work to occur onsite (e.g. laboratory access), and restrictions (to some degree) continue for many.
  - Many of the businesses' staff were on furlough or were at risk of redundancy and therefore resource to progress R&D work was limited.
  - Businesses could not collaborate on a cross-border basis with their Academic partners due to travel and social distancing restrictions.
  - It was difficult for new partnerships to be formed and developed as they could not meet face to face, or have the Academic partner visit the company premises to progress project development activities.
  - Recruiting remotely for interns was, and continues to be, difficult.
  - 8 approved projects and also potential projects in the pipeline requested that their projects be put on hold due to COVID-restrictions, or simply as they needed to focus on their business' survival (meaning Co-Innovate was not a priority).
  - On hold projects, will cause a project delivery completion delay, and the Co-Innovate team need to monitor this to ensure that any delay does not exceed the remit of the overall Programme LoO date.
  - Scottish Enterprise was temporarily not allowed to award grant funding to any business other than for their COVID support programmes. This has meant that their progress in Strand 4 was on hold until these restrictions were lifted on the 20th of May 2020.

- The promotional campaign for direct applicants to Strand 4 was put on hold. It was the Co-Innovate's team view that it would have had limited effectiveness during the pandemic and may have been insensitive in the prevailing socio-economic climate.
- For many of the SME participants, their innovation strategies were under review (as were all aspects of their business) and much of their activity was on hold while they deal with administering and prioritising emergency funding for their businesses. The project partners report that R&D, in particular, was not considered by many to be a priority but it was envisaged that this will change as society moves into a recovery period later, but not without some delay to progressing the project pipeline.
- The Co-Innovate team was restricted in how it could recruit, engage and meet with new potential projects also, which was not ideal for encouraging businesses to enrol on the programme or help develop the project applications as the team would have normally operated.

In summary, it is the Co-Innovate Team's view that these factors have had an impact on the delivery of Strand 4 and will continue to have a negative effect on their ability to deliver the business to academia projects as the COVID-19 restrictions and its impact continue.

- To try and minimise the impact caused by the COVID-19 pandemic and associated restrictions, the Co-Innovate partners have developed a list of proposals to review with SEUPB as a means to address the impact. These are detailed in Table 10.9 overleaf.
- Also, InterTradeIreland has utilised forecasted underspend in their budget to run an open competition and procured the services of Helix to generate high-quality leads, develop partnerships with academics, support the writing of applications, and achieve 45 approved Strand 4 project applications on the Island of Ireland. Helix was appointed in mid-February and are working with the Strand 4 manager to increase the rate of approved projects. However, discussion with Co-Innovate highlighted that Helix is having difficulty recruiting businesses, as many are on FUSION, a similar InterTradeIreland programme.
- In the Co-Innovate Team's view, the most significant factor relating to the new business climate and Covid-19's impact on Strand 4 (collaborative R&I projects between a business and an academic partner) is how this intervention is perceived (by SMEs) as being less important than it was when first envisaged in 2016 and up to the beginning of 2020(i.e. pre-pandemic). According to the project partners, the businesses who typically get the benefit from and engage with Strand 4 are those with more limited funds and resources, compared to those that participate in Strand 5. The project magnitude in terms of the financial, resource and time commitment they need to undertake for a Strand 4 project is greater than for those businesses in Strand 5 by comparison.

  The Strand 4 support provides the enterprise with up to 50% funding to employ a 1-year Intern to help the project delivery and knowledge transfer to the company, and 100% costs of the Academic's time for 24 project days throughout the year project duration, and some limited travel costs. It does not cover any other project delivery costs such as labour or current staff who will support and deliver aspects of the project, materials, testing, consultancy, prototypes, IP, etc.

  The project partners advise that under the prevailing 'Covid-19 environment', many businesses are looking at how to safeguard their business and have needed to make difficult decisions to furlough or even make some staff redundant. As Strand 4 has the mandatory requirement for businesses to recruit an additional employee in the form of the Intern to enable job creation, it could in effect add a significant cost to the business. The project partners further consider that it may also be insensitive for businesses to employ a new additional employee whilst furloughing or making other existing staff redundant. As project costs in Strand 4 are not eligible costs to claim under the Programme, these are 100% at the enterprises' own expense and therefore may add significant cost to their core business expenditure.

  Therefore, in a time and business environment when survival is the priority and generating cashflow and liquidity for many SMEs is key, the project partners consider that Strand 4 intervention and support may be less appropriate and in turn, might be leading to lower demand (than had been anticipated pre-COVID) from businesses at this time. InterTradeIreland notes that this experience

has been mirrored it other innovation programmes such as the FUSION and KTP programmes. The Project Partners, therefore, consider that the Output Indicator target (70 projects to complete) that was established in 2016 does not reflect the prevailing economic climate.

- The Co-Innovate Partners emphasis that they will strive and make every effort to fully meet this target of 70 completed projects, but with ongoing COVID-19 related impacts and restrictions, and some approved/pipeline projects withdrawing (and a risk that more may withdraw as the pandemic continues), a shortfall in the Output Indicator target number for Strand 4, i.e. Indicator 1.213 "Number of enterprises engaging an Innovation Intern" (70), is likely. The project partners have advised the Evaluation Team that between 55-60 (80%-86%) projects are now more likely to be completed.

It is evident that the COVID-19 pandemic and associated restrictions have had a negative impact on the programme's ability to recruit SMEs onto Strand 4, and there is a real risk that the programme will not achieve its output indicator and targets associated with this strand. However, given the current circumstances, and potential for further lockdowns in the coming months, it is the Evaluation Team's view that whilst the programme will likely not be able to reach its original target, it should be viewed positively that the programme is confident that it will be able to achieve between 80% and 86% of the original Strand 4 target.

Table 10.9: Strand 4 Proposals and SEUPB Response					
	Co-Innovate Proposals/Ideas	**Initial Outcome**	**SEUPB Response**	**Co-Innovate Feedback**	**SEUPB Final Determination (August 2020)**
1	Increase support days available to Scotland to Rep. of Ireland & Rep. of Ireland to Scotland projects to balance the lost days of travel.	Rejected by SEUPB	No Change in position, travel is also currently limited due to COVID and it has shown that technology can be used to maximise the time on the project.		Rejected by SEUPB
2	Recruiting an Intern while furloughing or making staff redundant is far from ideal. Proposal for no Intern required, the project goes ahead just between the company and academic institute. The project is still developing the new product/service, embedding new knowledge into the company and academic institute, and creating the academic link. It would still achieve Indicator CO26, but not indicator 1.213.	Rejected by SEUPB	That was not how strand 4 was conceived so does not meet the spirit.	-	Rejected by SEUPB
3	Recruiting an Intern while furloughing or making staff redundant is far from ideal. An intern can be appointed from a current member of staff who would have been made redundant, with no need to backfill. The programme is looking to achieve job retention and redeployment onto an innovation project. The activity of the R&D project is an additional output of this intervention being met, even by moving an at-risk employee into the Intern role. Without this, the innovation project will not proceed for some companies. A useful and appropriate tool in the recovery phase for businesses.	Rejected by SEUPB. Co-Innovate: The project partners would like this to be reviewed again by SEUPB.	It was originally rejected on the basis that they intended to move staff into Interns posts rather than furlough. If a transparent competition is run then SEUPB could agree with this. Please provide details of how this would be operationalised.	By "transparent competition" does SEUPB mean via Co-Innovate's normal recruitment process on the open job market, or an internal competition within the company where it can be evidenced who was selected and why. The former is what the programme currently implement but feel is not appropriate for some companies under the current Covid environment. The latter would be more appropriate in certain cases to have the option to implement, and Co-Innovate team feel they can ask companies who would utilise this approach to justify who and why if the process is approved by SEUPB. For legal reasons, the Co-Innovate partners do not become involved in the actual interviewing and selection of the Interns but check a due	In principle, this can be considered on a case by case basis with the details being agreed in advance with SEUPB to assist with eligibility.

Table 10.9: Strand 4 Proposals and SEUPB Response					
	Co-Innovate Proposals/Ideas	**Initial Outcome**	**SEUPB Response**	**Co-Innovate Feedback**	**SEUPB Final Determination (August 2020)**
				process has been followed and a candidate meeting the job criteria has been appointed.	
4	Increase the feed to Strand 4 by splitting the 10 days in Strand 3 into 5 days and offering to twice as many businesses from those numbers outstanding.	Rejected by SEUPB Co-Innovate: We would like this to be reviewed again by SEUPB due to Covid now being an issue.	Same question as above (q.2). Are the required days for strand 3 no longer required?	See response in Table 10.7 in the Strand 3 section. Co-Innovate is able to utilise the full 10 days support in all cases to date. The rationale is they can still be an effective support to companies with 5 days, for example, but increase those companies they can develop the innovation capabilities for in preparation for them to undertake innovation activity and R&D projects in general.	Approved on a case by case basis.
5	If projects are put on hold due to Covid-19 lockdown, then the partners have the gift to extend the project LoO end date to accommodate the months lost during on hold, to take the project duration back to 12 months (as long as they can be completed within the timeframe of the Programme LoO).	Approved by SEUPB	SEUPB agreed on the basis it would be informed of the projects and no costs would be claimed for furloughed staff.	Understood and Co-Innovate is already informing SEUPB of these circumstances.	Approved by SEUPB.
6	Let Recruitment Agencies put candidates for Interns forward in response to open job advertisements. If their candidate is successful, then the company pay the salary to the Agency and we reimburse 50% of that within our €40k limit. Procurement on services exercise not required.	For consideration	In principle SEUPB agree, please can you provide further details on how this would be implemented.	The process would not be much different from how we currently operate. Co-Innovate would advertise any Intern position on the open job market as usual but would contact numerous recruitment agencies to inform them of the Co-Innovate positions in general so they would make themselves aware of them being posted. Co-Innovate would hold the normal interview and candidate selection process as normal (conducted entirely by the company and academic partner), and if they selected a candidate that was provided by a recruitment agency then the	Agreed on a case by case basis.

Table 10.9: Strand 4 Proposals and SEUPB Response					
	Co-Innovate Proposals/Ideas	**Initial Outcome**	**SEUPB Response**	**Co-Innovate Feedback**	**SEUPB Final Determination (August 2020)**
				company would pay the agency the salary fee and in turn, the company would invoice Co-Innovate for 50% of this cost up to our €40k limit per project.	
7	Start project now but recruit Intern to commence later and therefore have a shorter-term in the post (risk of not being able to find suitable candidate later and therefore what happens if appointment not made)	For consideration	SEUPB have no issue with this but the risk belongs to the project if they fail to recruit an Intern and costs cannot be claimed.		Agreed.
8	Risk of losing staff while the company is in lock-down and Intern not paid. This would take additional time to recruit a replacement Intern when restrictions are removed. Encourage retention of Intern by allowing the Programme to fund the furloughed Interns.	For consideration	SEUPB cannot pay for staff or interns while they are furloughed.	-	
9	Company collaboration is restricted at this time as people cannot travel. Relax the requirement for cross-border collaboration and allow partnerships to be made between companies and academics within the same region.	For consideration	This is contrary to the programme rules and spirit and cannot be supported.	-	
10	Could a consultant take up the role of the Intern but for 2-3 days per week to carry out the project work and help embed the new knowledge into the business?	For consideration	Please can you provide details that you have exhausted every avenue before this option can be considered?	Co-Innovate could hold an open recruitment exercise for the Intern as normal. If unsuccessful, then the company could seek 3 quotes for consultancy support for 2-3 days per week instead of the full-time Intern employment, capped at the €40k limit per project. Co-Innovate would inform SEUPB of the unsuccessful recruitment exercise and seek permission to utilise the consultancy option in each case.	This can be considered on a case by case basis.
11	Front-load the grant payments or have them upfront as a means to get liquidity into businesses and encourage them to participate. This would mean payments before claims vouched (similar to partner eMS claims 80% Covid option) but carry associated risks.	For consideration	In principle SEUPB is content with this, the risk would be held with the Project subject to verification. Please can you provide details of the scheme?		Agreed in Principal.

Table 10.9: Strand 4 Proposals and SEUPB Response					
	Co-Innovate Proposals/Ideas	**Initial Outcome**	**SEUPB Response**	**Co-Innovate Feedback**	**SEUPB Final Determination (August 2020)**
12	If a project has been impacted due to Covid-19, allow the payment of Intern salary beyond the 12 month project period (if the full €40k allocation limit has not been utilised) for the partners to adjust the project progression due to the impact (e.g. tests may have needed to be cancelled midway when the lockdown occurred and must be restarted).	For consideration	SEUPB have no issue with this other than time, please providing details that they can be completed within the LoO timeline.	Co-Innovate will inform SEUPB in each case when extending the Intern's contract length beyond the standard 12 month period, with the understanding that projects need to be completed within the LoO timeline and we cannot exceed a €40k salary budget for the totality of that Intern's employment.	Agreed.
13	As companies have limited finances available at this time due to the Covid pandemic, enterprises, in general, are focused on business survival, getting liquidity into the business, and lowering costs, expecting business at this time to increase their costs by recruiting an intern and conducting an R&D project goes against the current crisis. Increasing the intervention rate from 50% to 75% or 100% would be an effective and appropriate offering for the Strand 4 support at this time, reflective of the unexpected environment we are operating within.	For consideration	This would be a significant change and not something SEUPB can support at this time.	-	Cannot be supported.
14	Currently, in Strand 4 Co-Innovate only fund 50% of the Intern's salary and 100% of the 24 project days support by the Academic Lead. Allowing the programme to provide grant support to cover project costs like Strand 5 (e.g. existing staff costs & 15% overhead, equipment, IP, external expertise & consultancy, trials and testing, IP, materials) at the 50% match funded rate, it would enhance the desirability of the Strand 4 support on offer and make it a more appropriate support to businesses at this current time as it is a way to get liquidity back into them for innovative actions they can undertake to help their future recover at this challenging times. An additional budget may be required to fund this requirement as this cost will most likely be beyond the underspend levels within the programme currently.	For consideration	No additional budget is available at this time.	-	No further budget to support this.

Strand 5 - Targets

At September 2020, 19 businesses had been approved to receive Strand 5 Feasibility Study support. It is understood that 12 have been approved for full Strand 5 support, and 10 Business Partnership projects have commenced.

Table 10.10: Progress under Strand 5									
	No. of Business Partnerships			No. of Network Projects			No. of Research Agencies Involved		
	NI	ROI	Scotland	NI	ROI	Scotland	NI	ROI	Scotland
Business Plan Target	6	5	4	2	1	1	2	1	2
Feasibility Studies Approved (at Sept 2020)	8	2	9	1	0	0	1	1	18
B-B/Cluster Projects Approved, but not yet started (at Sept 2020)	1	0	1	0	0	0	0	0	2
Actual Started (at Sept 2020)	5	2	3	1	0	0	0	1	8
Actual Completed (at Sept 2020)	0	0	0	0	0	0	0	0	0
Difference	**-1**	**-3**	**-1**	**-1**	**-1**	**-1**	**-1**	**-**	**+6**

Discussion with Co-Innovate highlighted the following concerning Strand 4:

- Similar to Strand 4, to try and minimise the impact caused by the COVID-19 pandemic and associated restrictions, the Co-Innovate partners developed a proposal to review with SEUPB as a means to address the impact, which is detailed in Table 10.11 on page 111.
- Despite the restrictions and economic pressures on businesses for the last 6 months and onwards, the project partners advise that the impact on Strand 5 has not been as great as that on Strand 4. As of October 2020, only 1 of the approved projects went on-hold as a result of Covid-19 restrictions closing access to its laboratories. However, this project has since recommenced with the easing of the restrictions. All other projects are continuing to progress with their collaborative project. Nonetheless, there is a possibility that this may change with the ongoing fluid working environment, especially over an extended period, which cannot be known at this stage.
- The Co-Innovate Partners continue to be confident that they will meet the Output Indicator target of 30 SME within the current timeframe of the programme, due to the relatively unaffected pipeline of high-quality businesses and projects that they have been engaging with and developing to date. The project partners also advise that there remains a strong demand for access to the Strand 5 support from businesses in the eligible region, again in contrast to that of Strand 4. However, there are significant key differences between these two interventions and the support provided which the project partners consider are the reasons underpinning the strong demand for Stand 5 support (despite the impact of COVID-19).
- The Co-Innovate Team is of the view that the structure and nature of support provided by Strand 5 continue to be appropriate in the prevailing economic environment, which they suggest is reflected in the high demand for the support. They further advise that Strand 5 activity also aligns with the initial findings from the Peace Plus consultation in early 2020, which have recommended that going forward for the new programme of support (in Theme 2 - Delivering Economic Regeneration and Transformation) that it will be vital to have a focus on boosting growth through support to improve the competitiveness of SMEs, through actions to support the recovery of industry and sectors post the COVID-19 pandemic. The project partners note that Strand 5 has the potential to help SMEs manage the economic challenges associated with COVID-19, and consider that it positions itself strongly to be able to make a positive impact before Peace Plus commences and to be able to provide support which is in more relevant areas to address the health and safety and economic challenges of COVID associated with SMEs.
- Whilst there is a sufficient pipeline of projects on the Island of Ireland and entry for any new applicants has been closed, the project partners consider that there is a high risk that Scottish Enterprise will not be able to achieve its target of Business to Business (B2B) projects.

- Concerning this point, it is understood that the Co-Innovate project has recently proposed a countermeasure[125] to SEUPB to enable the programme to utilise underspend within the existing approved budget to allow ITI to deliver between 1 and 3 Strand 5 B2B projects led by Island of Ireland companies, to offset potential projects that will not take place in Scotland. According to the project partners, this would reduce the 25% project allocation within the Scottish region, but note that if Scotland cannot fulfil these projects, this would be the resulting outcome regardless. According to the project partners, this would help ensure that the main Strand 5 Output Indicator (i.e. Indicator CO41 "Productive investment: Number of enterprises participating in cross-border, transnational or interregional research projects") will be achieved.

In the Evaluation Team's view, given the risk to Co-Innovate's Strand 4, that it may be appropriate to reallocate funds from Strand 4 to complete additional B2B projects, where demand exists, under Strand 5, considering that Strand 5 (in theory) offers significant potential for economic impact to be realised in the eligible region. This is even more relevant considering that the project has spent only 27% of its total budget at October 2020 despite being more than two-thirds of the way through its project period.

[125] Source: 'Co-Innovate Case for Consideration, 16/10/2020' Report.

Table 10.11: Strand 5 Proposals and SEUPB's Response				
	Co-Innovate Proposals/Ideas	**SEUPB Response**	**Co-Innovate Feedback**	**SEUPB Final Determination (August 2020)**
1	SEUPB allow Co-Innovate to approve and count against the output indicators projects of lower timeframe than the 18-24 months they currently consider? These would likely incur a lower project expenditure level as well and not utilise all of the €150k funding limit available per B2B project. Reflecting on output indicators CO02, CO41 and CO42, none of these state any requirement for time or expenditure maximum/minimum expectations, so they believe this should be an eligible option for SEUPB to approve while also being eligible to meet the criteria to count as numbers against each of these output targets. The lower timeframe and financial commitment may be more appetising for businesses at these times of COVID-19 challenges and should allow the programme to attract and support more businesses than it would otherwise. So, for example, a 1-year project, at a funding level of €75k could be a more palatable commitment for an enterprise partnership to make at this time (when business survival is priority) and a more manageable risk than €150k over 18-24 months. It can also act as a mechanism to help the business generate a development that facilitates survival.	SEUPB are in principle happy to agree with the reduction in time and associated finance. Please can Co-Innovate provide the details for the number of projects and associated impacts on outputs and finance?	At this point Co-Innovate has not offered any project durations below the 18 months, so do not know how many projects are likely to avail of this once promoted. Co-Innovate feels at this time that the 3 cluster projects and 9 B2B projects on the Island of Ireland will all be fulfilled with the standard 18-24 month project duration with the current pipeline of projects we are managing unless a significant number decide to exit the programme themselves or final project applications do not meet the required standard for approval. In the SE and HIE regions, 4 B2B projects are outstanding, and it is felt that some of these could avail of the shorter duration and lower financial commitment. Co-Innovate would be happy to inform SEUPB of these projects as and when they arise so you have knowledge of their details and can approve the case before significant application development work & time being undertaken. This is similar as to how we handle cases where funding is to be granted outside the eligible region of NI, 6 border counties of RoI, and Western Scotland.	Agreed on a case by case basis.

Other

The Co-Innovate project partners also cite the project's key achievements (between November 2018 and July 2020[126]) as being:

Table 10.12: Other key project achievements		
Period	**Dates**	**Key Achievements/Points of Note**
10	1st November 2018 - 31st January 2019	• 3 SMEs were approved to start their Strand 4 Projects. The next stage was to recruit a Project Manager before beginning the actual project work. 7 SMEs were matched with Academic partners by Helix/Interface & write their full project applications • 1 SME was approved to receive €7k funding to develop its business case for the full project application. There was a healthy pipeline of good potential collaborative projects in all regions. • Development of MIS by targeting Innovation continued with strand 5. A new report was tested for programme monitoring • G17 developed the Strand 4 recruitment portal as part of the Co-Innovate website. • Partners submitted an updated paper for potential additional funds to uplift programme output numbers.
11	1st February 2019 - 30th April 2019	• Strand 3 - 6 additional SMEs completed their innovation capability development (6 NI). Helix & Targeting Innovation appointed the mentors • 5 additional SMEs were approved to start their Strand 4 Projects. 6 SMEs were matched with Academic partners by Helix/Interface to write their full project applications • Strand 5 - 2 businesses were approved by the panel to receive up to €7k funding to develop their full project application (now awaiting full application). An additional 1 had been approved but was no longer to be supported as their status had changed to large enterprise. • Recruitment portal on a website developed by Green 17 completed.
12	1st May 2019 - 31st July 2019	• Strand 3, 11 additional SMEs completed their innovation capability development (6 NI, 4 RoI & 1 SE). Helix & Targeting Innovation appoint mentors. • 3 additional SMEs were approved to start their Strand 4 Projects. Further SMEs were matched with Academic partners by Helix/Interface to write their full project applications • Strand 5, 2 businesses were approved to begin their project work (awaiting signed letters of offer before permission to start). 3 businesses were approved to receive up to €7k funding to develop their full project application (now awaiting full application).
13	1st August 2019 - 31st October 2019	• Strand 3, 10 additional SMEs completed their innovation capability development (9 NI, 1 RoI & 1 SE). Helix & Targeting Innovation appoint mentors. • 3 additional SMEs were approved to start their Strand 4 Projects. The next stage was to recruit a Project Manager before beginning the actual project work. Further SMEs were matched with Academic partners by Helix/Interface & write their full project applications • Strand 5, 2 businesses were approved to begin their project work (awaiting signed letters of offer before permission to start). 1 business was approved to receive up to €7k funding to develop their full project application.
14	1st November 2019 - 31st January 2020	• Strand 3, 8 additional SMEs completed their innovation capability development (4 NI, 2 RoI, 1 SE & 1 HIE). Helix & Targeting Innovation appoint the mentors • 1 additional SME was approved to start their Strand 4 Projects. The next stage was to recruit a Project Manager before beginning the actual project work. • Further SMEs were matched with Academic partners by Helix/Interface & write their full project applications. • Strand 5, 1 business was approved to begin their project work (awaiting signed letters of offer before permission to start). 2 businesses were approved to receive up to €7k funding to develop their full project application.

[126] Please note that the key achievements have been documented in respect to the most recent Partner Project Progress reports that were available to the Evaluation Team at the time of writing. The most recently available collated Project Progress report for the project was for period 14 (November 2019 – January 2020).

Table 10.12: Other key project achievements		
Period	**Dates**	**Key Achievements/Points of Note**
15	1st February 2020 – 30th April 2020 (from partner progress reports)	• Strand 3, 10 additional SMEs completed their innovation capability development (4 NI, 1 RoI, 1 SE & 4 HIE). Helix & Targeting Innovation appoint the mentors • 6 additional SMEs were approved to start their Strand 4 Projects. The next stage was to recruit a Project Manager before beginning the actual project work. Further SMEs were matched with Academic partners by Helix/Interface & write their full project applications • Strand 5, 1 business was approved to begin their project work (awaiting signed letters of offer before permission to start). 4 businesses were approved to receive up to €7k funding to develop their full project application. • Strand 4 LEAP campaign was developed with Krow and was live to promote the straight to strand 4 option to businesses.
16	1st May 2020 - 31st July 2020 (from partner progress reports)	• COVID-19 had a significant impact on recruitment to Co-Innovate in this period. Companies continued to be closed, with staff furloughed or in survival mode. This slowed down some activity and paused others. Recruitment was pretty much paused, but the majority of ongoing projects continued to progress. • A new agency replaced Scottish Enterprise in Dumfries and Galloway. South of Scotland Enterprise would now be responsible for economic development in the south - staff were beginning to be recruited into roles here and discussions began with key members of staff to make them aware of Co-Innovate support which is available. • Workshops were moved online to webinars. The first scheduled webinar was beset with technical issues. The next webinar was to take place early P17 to drive leads for S2,3,4 and 5.

10.4.2 Progress towards the Project's Output Indicators

Table 10.13 provides a high-level summary of the progress that has been made by the Co-Innovate project towards its Output Indicators.

Table 10.13: Progress towards the Co-Innovate Output Targets					
Output Code	**Description**	**Programme Targets**	**Co-Innovate Target**	**Progress (At September 2020[127])**	**Variance against project target**
CO01	Productive Investment: Number of enterprises receiving support	1,408	1,408	1,394	99%
CO02	Productive Investment: Number of enterprises receiving grants	19	30	8	27%
CO04	Productive Investment: Number of enterprises receiving non-financial support	1,408	1,408	1,394	99%
CO26	Research, Innovation: Number of enterprises cooperating with research institutions	50	50	29	58%
CO41	Productive Investment: Number of enterprises participating in cross-border, transnational or interregional research projects	19	30	8	27%
CO42	Productive Investment: Number of research institutions participating in cross-border, transnational or interregional research projects	5	5	5	100%
1.22	Number of enterprises receiving one-to-one innovation advice	469	469	331	71%
1.23	Number of enterprises in receipt of an Innovation Capability Development Programme	94	94	92	98%
1.24	Number of enterprises engaging an Innovation Intern	70	70	29	41%

[127] Source: SEUPB's quarterly monitoring data.

10.4.3 Target Groups Reached

Table 10.14 provides an overview of the target groups reached as a result of the Project's activity. In summary monitoring materials provided by the Project Partners indicate that the Co-Innovate Programme has reached 99% of its target group.

Table 10.14: Target Groups Reached

Target Groups	Target Value	Target Groups Reached (at September 2020[128])	Target Groups Reached %
SMEs	1,408	1,394	99%

10.4.4 Progress towards the Project's Result Indicator Targets

As noted in Section 1.2.4, the result indicator for the Co-Innovate project is to increase the percentage of SMEs in the eligible region involved in research and innovation involving cross-border collaborations from 22%[129] (2014) to 33% by 2023. Per Report 1, the Evaluation Team has reservations concerning the degree to which the target is 'achievable' and 'realistic' and notes that progress can only be measured in the longer term.

10.5 Impact of COVID-19

As reflected in Section 2, key findings related to the impact of COVID-19 or otherwise on the Co-Innovate project include the following:

- Despite the progress made (see Section 10.4), the restrictions associated with the COVID-19 meant that:
  - Various staff across the lead partner's organisation, project partners or direct beneficiaries started working remotely, were furloughed (including LEA staff, albeit none of these staff is 'full-time' on Co-innovate. The only full-time staff member that Enterprise NI has allocated to the Programme has not been furloughed), or made redundant.
  - It is not anticipated that many delivery partners will return to their offices until 2021 and face to face meetings with clients are only approved on an individual basis, with recruitment, workshops, business status reviews, innovation audits, and mentoring needing to largely be delivered remotely, which has slowed progress and removed the human engagement element with the partnership considers to be preferential and beneficial.
  - As offices have not been accessible under normal circumstances, there has been some administration challenges regarding obtaining original signatures and some hard copy documentation. Nonetheless, the project is considered to be fully operational in the 'new normal' business environment.
  - Facilitating cross-border collaboration and employing interns became much more difficult (which the partnership considers has been exacerbated by businesses' perceptions of potential Brexit related risks);
  - Travel and use of laboratories has been restricted;
  - Strand 4 projects have, in particular, been affected, as companies facilities were locked down so the R&D could not continue in many cases. Furthermore, academic institutes were closed which has caused issues accessing the academic lead or university facilities. The project reports

[128] Source: SEUPB's quarterly monitoring data.
[129] NB: To determine this baseline, SEUPB advised that specific questions were introduced into the January/February 2015 version of InterTradeIreland's quarterly All Ireland Business Monitor Survey. It is understood that 146 (22%, N=676) of the business respondents indicated that they undertook R&D&I and were supported by another organisation outside their own jurisdictions i.e. Northern Ireland, the border region of Ireland or Western Scotland. For the purposes of this paper (which focuses on cross-border collaborative R&D&I activity being between Northern Ireland and the border region of Ireland, excluding Scotland), SEUPB advised that 119 (22%, N=548) of the total business respondents based in either Northern Ireland (N=79) or border region of Ireland (N=40) indicated that they undertook R&D&I and were supported by another organisation outside their own jurisdictions i.e. Northern Ireland or the border region of Ireland.

that it has also been difficult to hold recruitment drives or interviews to recruit Interns. Indeed, many companies were not in a position to employ a new Intern as staff while they furloughed or laid-off existing staff.
- Consequently, five Strand 4 businesses left the programme as a result of COVID-19, whilst others have placed their Strand 4 projects on hold (and it is not yet known whether they will recommence their projects). The partnership considers that further attrition is likely but cannot be quantified at this stage.
- The partnership considers that for many businesses, implementing innovation-focused projects will no longer be a priority, as they may be more focused on simply ensuring their survival;
- Whilst the Strand 5 projects are progressing, the project partnership is considering looking at COVID-19 related Strand 5 projects (which is a new approach that is being discussed with SEUPB).

- Consequently, discussion with the Co-Innovate project partnership indicates that:

  - The project is behind schedule and there is now a risk that it will not achieve its aims and objectives due to restrictions on travel and access to laboratories;
  - In particular, the achievement of targets associated with Strand 4 is a major risk, as 5 businesses left the programme as a result of COVID-19 and it is not yet known whether others will recommence their projects;
  - It may not be feasible for Co-Innovate to make up for delays experienced due to the pandemic. Also, if those projects that went on hold due to COVID-19 restrictions, it would take at least six months to agree and set-up new projects to replace them;
  - The partnership would like a project extension to allow for the months lost due to the pandemic.
  - The partnership believes that if an extension is provided, they will be able to deliver the project fully within its current budget;
  - Without an extension, the project anticipates a 20% underspend on an overall basis;

- The Evaluation Team notes that discussion (during December 2020) with SEUPB's Joint Secretariat indicates that it is working closely with each of the Priority Axis 1 projects to establish the impact of the pandemic on their project and their potential requirements (e.g. project extensions). SEUPB's anticipates that it will receive formal feedback on these matters from each of the projects during early 2021. The Joint Secretariat's discussions with the Co-Innovate project partnership indicates that the project would prefer an extension. The Joint Secretariat intends to commission an Independent Project Review during December 2020 which will consider options to address the issues that Co-innovate is experiencing.

11. CONCLUSIONS AND RECOMMENDATIONS

11.1 Conclusions

11.1.1 Impact of COVID-19

The key findings from the Evaluation Team's consultation with project partners include:

- 6 of the 8 projects consider that the onset of the COVID-19 pandemic and the associated lockdown and disruption to normal working practices have created a risk that their project will not fully achieve its aims and objectives. One project (NWCAM) considered that there was a 'high risk' that this was the case;
- 3 of the 8 projects have made some adaptations to their project as a result of the COVID-19 pandemic;
- 3 of the 8 projects consider that their project will likely require an extension to its originally anticipated timescales to complete successfully; and
- 1 of the 8 projects considers that they will likely not be able to spend their full budget allocation.

It should be noted that the Evaluation Team spoke with the projects at a time (end of August/start of September) when COVID-19 restrictions had been eased/lifted to some extent and projects may have been more optimistic about the project's ability to achieve its aims and objectives within the original timeframe. However, at the time of writing (late December 2020) further restrictions are being implemented in Northern Ireland and the Republic of Ireland, which may pose a significant risk to cross-border collaboration activities during their implementation.

Of note, whilst 6 projects felt it was feasible to make up for the delays experienced as a result of COVID-19 (at August/September), they noted that this would depend on how long the lockdown continues for, as although the projects adapted well to remote working, some work cannot be completed remotely (e.g. laboratory-based work). It is the view of the evaluation team that the ongoing uncertainty associated with the duration of lockdowns and the severity of restrictions, there continues to be a significant ongoing risk to the successful completion of the projects.

11.1.2 The Current position of the projects

Specific project conclusions are detailed below:

<u>NWCAM</u>

NWCAM has been performing well in terms of progress towards its output indicators, having already exceeded a number of targets, as of September 2020. However, the project had only delivered 2 publications with cross-border authorship at August 2020, against a target of 30.

Unfortunately, as a result of the pandemic, the NWCAM project partnership considers that the project is now behind schedule, with a 'high risk' that the project will not fully achieve its aims and objectives. Various staff across the lead partner's organisation, project partners or direct beneficiaries started working remotely and/or were furloughed. This included Glasgow University who furloughed staff, which has had an impact on the number of research years for that period. Subsequently, NWCAM anticipates that it will not be feasible to deliver the project's planned activities within the original timeframe as some projects may not be able to carry out testing, due to research facilities having to close.

Furthermore, NWCAM indicated that additional funding may be required to hire an additional researcher to help to make up for the lost research years. The Evaluation Team considers that this presents a particular risk to the project, particularly in the current uncertain climate, with new lockdown measures coming into force and the threat of further restrictions. Also, as of December 2020, the project had only spent 61% of the total budget (against a forecasted position of 81% at the same juncture), and

71% of the project timescale has now passed. Therefore, without a project extension, there is perhaps a potential risk of underspend associated with the project.

Of note, various project partners have been involved were involved in the response to the COVID-19 pandemic. For example, Armstrong medical, a specialist manufacturer of breathing and respiratory products scaled up its capacity to manufacture disposable breathing circuits and electromedical devices for Intensive Care Units (ICUs) to meet global demand. Recently they launched a range of products including the AquaVENT VT breathing circuit which incorporates some of the research & development (R&D) generated from the NWCAM collaboration with Ulster University.

Renewable Engine

The Renewable Engine project is making strong progress and all outputs have been, broadly, proceeding according to the workplan, with the project having already achieved all but one of its output indicators. As of August 2020, the project had completed 6 peer-reviewed journal and conference publications with cross-border authorship representing 60% completion against its result target indicator of 10. The project has also supported businesses to take forward commercially-focused R&D which may not have been undertaken in the absence of the project due to their capacity and capability.

Nonetheless, the COVID-19 pandemic has had a considerable impact on staff across the project partners and beneficiaries with most encouraged to work remotely, whilst others (within the industry partners) were furloughed or made redundant. Despite this, discussion with the Renewable Engine project partnership indicates their view that the project continues to be on track with little risk to it fully achieving its aims and objectives.

Some of the project's 2020 planned activities, including planned dissemination activities, are now anticipated to be implemented during 2021. However, the project partners consider that it is feasible to make up for delays caused by the pandemic and suggest that they will be able to deliver the project fully within its current budget, whilst noting that an extension to the project timeframe would be beneficial. This may suggest that there is a risk that the project will not fully achieve its targets within the current timeframe.

Furthermore, the project partners also consider that there is a risk to the project in the form of the economic downturn meaning that some industry partners may not survive, which would erode the connection between the R&I that has been undertaken and potential subsequent industrial impacts.

As of December 2020, the project had only spent 68% of the total budget, against a forecasted position of 89% at the same juncture.

Bryden Centre

The Bryden Centre is making good progress against most of its outputs indicators. However, whilst it is anticipated that the Bryden Centre Project will contribute 68 peer-reviewed journal and conference publications with cross-border authorship, as of February 2020, the project had only produced 2. Discussion with the project partnership indicates that a number are in development and they anticipate that this element of the project's activity will ramp up as the research progresses.

The project partnership suggests that as a result of the pandemic their project is behind schedule and there is a risk that it will not fully achieve its aims and objectives. In particular, they highlight risk relating to PhD students' progress. Various staff across the lead partner's organisation, project partners or direct beneficiaries have also started working remotely, were furloughed, or were made redundant as a result of the pandemic

Whilst the Bryden Centre project partnership suggests that most of the project's planned activities will be delivered, they consider that there is a risk that some may not without a six-month extension (which the Evaluation Team understands has been requested). The project partners note that an extension was

required even before the onset of the COVID-19 pandemic, but that it would be feasible for the project to make up for COVID-19 related delays and to deliver the project fully within its current budget.

However, the project partnership is concerned about the potential impact of a second period of lockdown (which the Evaluation Team notes, at Late December 2020, has now been implemented), particularly its impact on the time available for PhD students to complete their projects, which might prevent the target of 34 PhDs and associated PhD years not being fully achieved. The Evaluation Team notes that with new restrictions now in place, this is a risk to the progress of this project.

It was further noted by the project partners that some of the industry partners appeared to have become more conservative about taking things forward. However, this has yet to be fully assessed as the project partners' planned visits to the industry partners to see how their Bryden Centre project had impacted the business have had to be cancelled/postponed due to the periods of lockdown.

As of December 2020, the project had only spent 53% of the total budget, against a forecasted position of 77% at the same juncture.

SPIRE 2

The SPIRE 2 project is making strong progress, with many of the project's output targets almost fully achieved as of July 2020. Concerning the results indicator target, whilst it is anticipated that SPIRE 2 will contribute 78 peer-reviewed journal and conference publications with cross-border authorship, at August 2020, the project had only formally recorded achieving 6 such publications. However, the SPIRE 2 project partnership advised that it was in the process of reviewing publications up to July 2020, and estimated that at July 2020 SPIRE 2 had 54 peer-reviewed publications either published or in draft format.

The SPIRE 2 project partnership suggests that as a result of the pandemic their project is behind schedule and there is now a risk that it will not achieve its aims and objectives due to being unable to access laboratories and also delays in onsite activities, with various staff across the lead partner's organisation, their project partners or direct beneficiaries either working remotely or been furloughed. The Evaluation Team notes that this risk to the project may further be exacerbated moving forward with new lockdown measures and restrictions continuing to be implemented.

Whilst the partnership considers that most of the planned activities should be delivered, some may not be due to the aforementioned limited site access. However, they indicate that this should not affect the project's ability to achieve its outputs and it should be feasible to make up for the pandemic-related delays, provided the project receives an extension. Albeit, the project lead noted that the threat of a second lockdown could hold the project up further.

The project lead notes that they will be able to deliver the entire project within their current budget, but that there may be a c.11% underspend. As of December 2020, the project had only spent 66% of the total budget, against a forecasted position of 79% at the same juncture.

Of note, the project partners' academic institutes were involved in the response to the COVID-19 relief effort including undertaking antibody testing, work on the 'track and trace' application with the Irish government and on a plumbing-free handwash system.

ECME

The ECME project is making strong progress towards the achievement of the project's output targets. However, the project partnership considers that achieving the result indicator target will be challenging due to the multi-disciplinary nature of the partners engaged in the project and the limited collaborative engagement available during the pandemic. Linked to this, during a consultation, the ECME project partnership consider that as a result of the pandemic their project is behind schedule (with a particular impact being a reduction in students' access to laboratories).

Consequently, the project partnership considers that the project will require an extension.

However, positively, where possible, some of the research has, with SEUPB's agreement, pivoted towards supporting efforts to address the impact of the pandemic, whilst continuing to meet the objectives of the project. In particular, the project altered the industrially focused mini-projects to focus on solutions to the World Health Organisation's identified challenges facing our society. This resulted in the formation of 9 projects, which were awarded up to €30k each in late May.

As of December 2020, the project had only spent 57% of the total budget, against a forecasted position of 72% at the same juncture.

BREATH

The BREATH project is making strong progress towards the achievement of the project's output targets and the result indicator target.

The BREATH project partners consider that the project is mostly on track with very little risk to the project fully achieving its aims and objectives as a result of the pandemic. It was noted that BREATH's PhD students took the time during the lockdown, when access to laboratories was restricted, to write up and analyse what they had completed up to that point for their theses. The project partners consider that this has helped to mitigate the risk of the project's aims not being fully achieved.

Nonetheless, the BREATH project partnership is of the view that the project may no longer be able to deliver all of its planned activities within the original timeframe citing the lack of laboratory access as the main reason for this. With new restrictions and lockdown measures being implemented, it is the view of the Evaluation Team that this may have a further adverse effect on the delivery of planned activities and could potentially lead to further delays.

As of December 2020, the project had only spent 72% of the total budget, against a forecasted position of 73% at the same juncture.

CPM

Whilst the CPM project is making progress towards the achievement of the project's output targets and the result indicator target, the project partnership considers that the project is behind schedule and there is a risk that it will not achieve its aims and objectives. Furthermore, the partnership is of the view that the project may no longer be able to deliver all of its planned activities within the original timeframe citing the fact that staff had to work remotely, and patient recruitment had to be suspended in March 2020. Also, there has been an increased workload for some researchers as the pandemic is relevant to the CPM project's area of study, with one doctor that is completing a PhD having to be redirected to clinical work (and away from the CPM project).

The CPM project partnership considers that most of the project's planned activities can still be delivered but some may not, particularly due to the impact of patient recruitment being delayed, events having to be rearranged virtually or cancelled. They consider that there will likely be a need for a project extension due to the delay in staff starting and a requirement for additional personnel. It is understood that the project has submitted a request to SEUPB for these amendments, which they suggest could be covered by an underspend in the project's salary budget.

As of December 2020, the project had only spent 54% of the total budget, against a forecasted position of 93% at the same juncture. Given this disparity, the Evaluation Team is of the view that there is a degree of risk that the project will not be able to deliver all of their planned activities, even with a project extension.

Co-Innovate

Whilst the Co-Innovate project has made good progress against its anticipated Strands 1, 2, 3 and 5 activity, progress against Strand 4 has been slower, with the project partnership reporting that it has been particularly affected by the COVID-19 pandemic. The project partnership advises that it has little concerns that it will not fully meet the targets established, other than those for Strand 4, within the original project timeframe.

The project partnership considers that it will need a further project extension of circa 6 to 9 months if it is to fully meet the targets associated with Strand 4. NB the project partners had requested a 9-month project extension during March 2020 and received approval for a 6-month extension to September 2022. The Evaluation Team notes that the likelihood of Strand 4 not achieving its target appears to have been exacerbated given the new (at December 2020) lockdown restrictions in both the UK and Ireland.

The Evaluation Team considers that the COVID-19 pandemic and associated restrictions have had an evident impact on the project's ability to recruit SMEs onto Strand 4 and it is likely that the project will not be able to reach its Strand 4 target. However, it should be viewed positively that the project partners consider that they will be able to achieve between 80% and 86% of the Strand 4 target.

Whilst the project partnership considers that there is a sufficient pipeline of projects in both Northern Ireland and Ireland for the project to achieve its Strand 5 targets, they suggest that there is a high risk that the Scottish partners will not be able to achieve their target of Business to Business (B2B) projects. However, it is understood that Co-Innovate has recently proposed a countermeasure[130] to SEUPB to enable the programme to utilise forecasted underspend within the already approved budget for InterTradeIreland to deliver up to three Strand 5 B2B projects led by businesses based on the Island of Ireland, to offset potential projects that will not take place in Scotland. InterTradeIreland noted during consultation that this would have the effect of reducing the 25% project allocation within the Scottish region, but suggested that if they cannot fulfil these projects anyway, the same outcome would ultimately be arrived at (in relation's to Scotland's allocation). InterTradeIreland advises that it could utilise the budget that has already been allocated to the Programme and would not require any additional funds to be provided. The project partners consider that this will help to ensure that the main Strand 5 Output Indicator (i.e. Indicator CO41 "Productive investment: Number of enterprises participating in cross-border, transnational or interregional research projects") is achieved.

The Evaluation Team notes that discussion (during December 2020) with SEUPB's Joint Secretariat indicates that it is working closely with each of the Priority Axis 1 projects to establish the impact of the pandemic on their project and their potential requirements (e.g. project extensions). SEUPB's anticipates that it will receive formal feedback on these matters from each of the projects during early 2021. The Joint Secretariat intends to commission an Independent Project Review during December 2020 which will consider options to address the issues that Co-innovate is experiencing with its Strand 4 activity. As such, the Evaluation Team considers that any actions relating to Co-Innovate should be informed by that review.

[130] Source: 'Co-Innovate Case for Consideration, 16/10/2020' Report.

11.1.3 Programme Expenditure Implications

Table 11.1 provides a summary of the total estimated expenditure to December 2020 and also the proportion of 'project time' that has passed at December 2020.

Table 11.1: Project Costs – Anticipated and Estimated Actual December 2020[131]

Project	Anticipated Total (€)	Anticipated Total at December 2020	Anticipated % of total budget at December 2020	Total Estimated Expenditure in December 2020 (€)	% of total budget	Proportion of Timescale Passed at December 2020
Objective 1.1						
NWCAM	8,779,853	7,116,442	81%	5,380,508	61%	71%
Renewable Engine	6,104,995	5,460,382	89%	4,166,864	68%	85%
Bryden Centre	9,752,680	7,466,789	77%	5,180,299	53%	79%
SPIRE 2	6,703,246	5,273,977	79%	4,449,707	66%	79%
ECME	8,362,917	5,979,953	72%	4,737,172	57%	79%
BREATH	8,506,929	6,198,640	73%	6,147,545	72%	79%
CPM	9,424,927	8,803,279	93%	5,095,011	54%	78%
Subtotal	**57,635,547**	**46,299,462**	**80%**	**35,157,106**	**61%**	**-**
Objective 1.2						
Co-Innovate	22,443,035	19,503,081	87%	6,652,979	30%	70%
Total	**80,078,582**	**65,802,543**	**82%**	**41,810,085**	**52%**	**-**

Key points to note in relation to expenditure (at December 2020) under INTERREG VA Programme[132] Investment Priority 1: Research and Innovation include:

- At an overall Axis level, the eight projects have incurred expenditure of half (52%) of their total budget. However, this differs considerably between the two Objectives:
  - Objective 1.1 projects have incurred expenditure of 61% of their total budget, against a budgeted position of 80% at the same juncture. During consultation, only one Objective 1.1 project (SPIRE 2) considered that there was potential for budget underspend at the end of their project period. However, given that most projects are more than three-quarters of the way through their project period, and expenditure is collectively just over three-fifths (61%) of the available budget, which compares with a budgeted position of 80%, the Evaluation Team considers that there may be a greater risk of underspend at the end of the project periods than anticipated by the projects themselves (perhaps as a result of 'optimism bias').
  - Objective 1.2 has incurred an expenditure of 30% of its total budget, against a budgeted position of 87% at the same juncture. Discussion with the Co-Innovate project partnership indicates that they anticipate that there will be underspend at the end of the project period.

[131] Source: SEUPB's EMS 14th December 2020
[132] For Northern Ireland, Ireland and Western Scotland

11.1.4 Progress towards Priority Axis Output & Result Indicators

Specific Objective 1.1

Encouragingly, despite the onset of the COVID-19 pandemic and whilst support is continuing to be delivered to business and industry, many of the output indicators under Specific Objective 1.1 have already been achieved and in most cases, exceeded by some considerable margin.

However, perhaps unsurprisingly, given the fact that the research elements of the projects continue to be undertaken, coupled with the reported delays in the recruitment of research staff, the number of PhD (or above) level research is currently 27% below target.

Table 11.2: Overview of progress made towards the Output Indicators under Specific Objective 1.1

Output Indicator	Programme Target	Combined project targets (based on project applications)	Total Actual Output for 7 project	Variance from Programme Target	Variance from Combined project targets
No. of enterprises receiving support	20	78	**103**	415%	32%
No. of enterprises receiving grants	10	26	**18**	80%	-31%
No. of enterprises receiving non-financial support	20	78	**103**	415%	32%
Years of PhD (or above) level research	514	636	**373.93**	-27%	-41%
No. of enterprises cooperating with research institutions	10	78	**107**	970%	37%
No. of enterprises participating in cross-border, transnational or inter-regional research projects	10	75	**101**	910%	35%
No. of research institutions participating in cross-border, transnational or inter-regional research projects	5	29	**34**	580%	17%

In terms of progress towards the Specific Objective's Result Indicator, the Evaluation Team notes that 132 peer-reviewed publications with cross-border authorship have been created, which is 62% lower than the combined projects' targets (albeit it is noted that the results reported will be subject to verification by SEUPB/NISRA). Based on the feedback from the Project Partners, the Priority remains on track to achieve the Result indicator at an overarching level.

Table 11.3: Overview of progress made towards the Result Indicator under Specific Objective 1.1

Output Indicator	Programme Target (per Annum)	Combined Project targets	Total	Variance from project targets
No. of peer reviewed publications with cross-border authorship	75	343	**132**	-62%

Specific Objective 1.2

Whilst progress has been made towards a number of the Specific Objective 1.2 output indicators, as noted in Appendix 10 Sections 10.4 and 10.5, the COVID-19 pandemic has negatively impacted the progress of Strand 4 activity in particular, and may impact on the project's overall ability to deliver on all of its Output Indicators (at least within the timeframes stipulated within its current LoO).

11.2 Recommendations

The Evaluation Team makes the following small number of recommendations:

1. Given the ongoing impact of the COVID-19 pandemic, it will be of great importance that SEUPB continues (as they have been doing throughout the pandemic) to regularly monitor the activity undertaken and progress made by each project. The Evaluation Team spoke with the projects at a time (the start of September 2020) when COVID-19 restrictions had been eased/lifted to some extent and projects may have been optimistic about their ability to achieve their aims and objectives within the original timeframe. However, at the time of writing (late December 2020), both the Republic of Ireland and Northern Ireland have announced new lockdown conditions that will last until at least mid-February 2021. The Evaluation Team considers that this will again impact the projects' ability to undertake laboratory and workplace-based research activities.

2. Of note, whilst 6 projects felt it was feasible to make up for the delays experienced as a result of COVID-19 (at August/September), they noted that this would depend on how long lockdown measures continue for, as although the projects adapted well to remote working, some work cannot be completed remotely (e.g. laboratory-based work). It is the view of the evaluation team that the ongoing uncertainty associated with the duration of lockdowns and the severity of restrictions, there continues to be a significant ongoing risk to the successful completion of the projects.

3. SEUPB should engage with projects as soon as possible to discuss potential changes to project activities, timelines or budgets (NB Subsequent discussion with SEUPB's Joint Secretariat indicates that it has asked each of the projects to formally report back in early 2021 as to any further project amendments that might be required as a consequence of the COVID-19 pandemic. A further point to note in relation to this, is that the Joint Secretariat advised that the Irish Government has offered to cover the cost of any extensions offered to PhD students to allow them to complete their studies, which may represent the potential for some saving to SEUPB).

4. Discussion with SEUPB's Joint Secretariat indicates that it intends to commission an Independent Project Review during December 2020 which will consider options to address the issues that Co-innovate is experiencing with its Strand 4 activity. As such, the Evaluation Team considers that any actions relating to Co-Innovate should be informed by that review.